

Water Resources Survey

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Part I:

HISTORY OF LAND AND WATER
USE ON IRRIGATED AREAS

and

Part II:

MAPS SHOWING IRRIGATED
AREAS IN COLORS DESIGNAT-
ING THE SOURCES OF SUPPLY

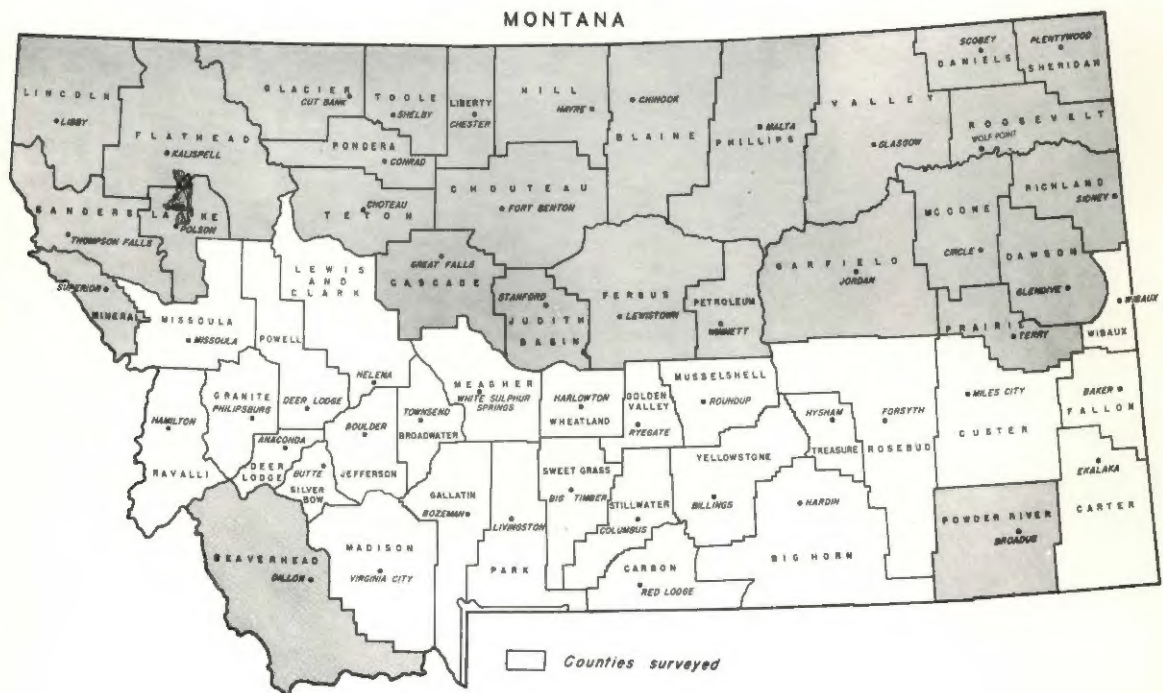
Missoula County, Montana

Published by
STATE ENGINEER'S OFFICE
Helena, Montana, June 1960

MISSOULA COUNTY
MONTANA

PART I

History of Land and Water Use on Irrigated Areas



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STATE ENGINEER'S OFFICE
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June, 1960

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MONTANA STATE AGRICULTURAL EXPERIMENT STATION

O. W. Monson, Irrigation Engineer and Consultant, Bozeman

June, 1960

Honorable J. Hugo Aronson
Governor of Montana
Capitol Building
Helena, Montana

Dear Governor Aronson:

Submitted herewith is a consolidated report on the Water Resources Survey of Missoula County, Montana.

This work is being carried on with funds made available to the State Engineer by the 36th Legislative Session, 1959, and in co-operation with the State Water Conservation Board and the Montana State Agricultural Experiment Station.

The report is divided into two parts. Part I consists of history of land and water use, irrigated lands, water rights, etc., and Part II contains the township maps in the counties showing in color the lands irrigated from each source or canal system.

Work has been completed and reports are now available for the following counties: Big Horn, Broadwater, Carbon, Carter, Custer, Deer Lodge, Fallon, Gallatin, Golden Valley, Granite, Jefferson, Lewis and Clark, Madison, Meagher, **Missoula**, Musselshell, Park, Powell, Ravalli, Rosebud, Silver Bow, Stillwater, Sweet Grass, Treasure, Wibaux, Wheatland and Yellowstone.

The office files contain minute descriptions and details of each individual water right and land use, which are too voluminous to be included herein. These office files are available for inspection to those who are interested.

The historical data on water rights contained in this report can never become obsolete. If new information is added from time to time as new developments occur, the records can always be kept current and up to date.

Respectfully submitted,

FRED E. BUCK, State Engineer

ACKNOWLEDGMENTS

A survey and study of water resources involves many phases of both field and office work in order to gather the necessary data to make the information complete and comprehensive. Appreciation of the splendid co-operation of various agencies and individuals who gave their time and assistance in aiding us in gathering the data for the preparation of this report is hereby acknowledged.

County Officials

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Wm. Lucier, Commissioner

H. W. Stoutenburg, Commissioner

J. R. Donehoo, Clerk of the District Court

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Elmer Flynn.....Secretary, Hellgate Valley Irrigation Company
L. L. Bulen.....Secretary, Missoula Irrigation District
Mrs. R. A. Shannon.....Secretary, Orchard Homes Ditch Company
Ray E. Nelson.....Secretary, Rattlesnake Valley Irrigation Company (Inactive)

The State Engineer's Office, Water Resources Survey, hereby expresses sincere appreciation to the many ranchers, farmers and stockmen who have given their helpful co-operation in this survey.

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FOREWORD

MONTANA'S WATER RIGHT PROBLEMS

Our concern over surface water rights in Montana is nearly a century old. When the first Territorial Legislature, meeting in Bannack, adopted the common law of England on January 11, 1865, the Territory's legal profession assumed that it had adopted the Doctrine of Riparian Rights. This doctrine had evolved in England and in eastern United States where the annual rainfall is generally more than twenty inches. It gave the owners of land bordering a stream the right to have that stream flow past their land undiminished in quantity and unaltered in quality and to use it for household and livestock purposes. Since the law restricted the use of the water to riparian owners and forbade them to reduce appreciably the stream flow, the early miners and ranchers in Montana favored the Doctrine of Prior Appropriation which permitted diversion and diminution of the streams. Consequently, the next day the legislature enacted a law which permitted diversion by both riparian and non-riparian owners. Whether or not this action provided Montana with one or two definitions of water rights was not settled until 1921 when the Montana Supreme Court in the *Mettler vs. Ames Realty Co.* case declared the Doctrine of Prior Appropriation to be the valid Montana water right law. "Our conclusion," it said, "is that the common law doctrine of riparian rights has never prevailed in Montana since the enactment of the Bannack Statutes in 1865 and that it is unsuited to the conditions here. . ."

The appropriation right which originated in California was used by the forty-niners to divert water from the streams to placer mine gold. They applied to the water the same rules that they applied to their mining claims—first in time, first in right and limitation of the right by beneficial use. Those who came to the Montana gulches brought with them these rules, applying them to agriculture as well as to mining.

The main points of consideration under the Doctrine of Prior Appropriations are:

1. The use of water may be acquired by both riparian and non-riparian landowners.
2. It allows diversion of water regardless of the reduction of the water supply in the stream.
3. The value of the right is determined by the priority of the appropriation; i. e., first in time is first in right.
4. The right is limited to the use of the water. Stream waters in Montana are the property of the State and the appropriator acquires only a right to their use. Moreover, this use must be beneficial.
5. A right to the use of water is considered property only in the sense that it can be bought or sold; its owner may not be deprived of it except by due process of law.

The State Legislature has provided methods for the acquisition, determination of priority and administration of the right. No right may be acquired on a stream without diversion of water and its application to a beneficial use. On unadjudicated streams, the Statutes stipulate that the diversion must be preceded by posting a notice at a point of intended diversion and by filing a copy of it within 20 days in the County Clerk's office of the county in which the appropriation is being made. Construction of the means of diversion must begin within 40 days of the posting and continue with reasonable

diligence to completion. However, the Montana Supreme Court has ruled that an appropriator who fails to comply with the Statutes may still acquire a right merely by digging a ditch and putting the water to beneficial use.

To obtain a water right on an adjudicated stream, one must petition the District Court having jurisdiction over that stream for permission to make an appropriation. If the other appropriators do not object, the court gives its consent and issues a supplementary decree granting the right subject to the rights of the prior appropriators.

Inasmuch as the Montana laws do not require water users to file official records of the completion of their appropriations, it becomes advisable as soon as the demand for the waters of a stream becomes greater than its supply, to determine the rights and priorities of each user by means of an adjudication or water right suit. This action may be initiated by one or more of the appropriators who may make all the other claimants parties to the suit. Thereupon the Judge of the District Court examines the claims of all the claimants and issues a decree establishing priority of the right of each water user and the amount of water he is entitled to use. The court decree becomes in effect the deed of the appropriator to his water right.

Whenever scarcity of water in an adjudicated stream requires an allocation of the supply according to the priority of rights, the Judge, upon petition of the owners of at least 15 per cent of the water rights affected, must appoint a water commissioner to distribute the water. After the Commissioner has been appointed the Judge gives him full instructions on how the water is to be apportioned and distributed in accordance with the terms of the decree.

The recordings of appropriations in local courthouses provides an incomplete record of the water rights on unadjudicated streams. In fact, the county records often bear little relation to the existing situation. Since the law places no restriction on the number and extent of the filings which may be made on an unadjudicated stream, the total amount of water claimed is frequently many times the available flow. There are numerous examples of streams becoming over appropriated. Once, six appropriators each claimed all of the water in Lyman Creek near Bozeman. Before the adjudication of claims to the waters of Prickly Pear Creek, 68 parties claimed thirty times its average flow of 50 cfs. Today, the Big Hole River with an average flow of 1,129 cfs. has filings totaling 173,912 cfs. A person is unable to distinguish in the county courthouses the perfected rights from the unperfected ones since the law requires no official recordation of the completion of an appropriation. Recognition by the courts of unrecorded appropriations adds to the incompleteness of these records. To further complicate the situation, appropriators have used different names for the same stream in their filings. In Montana many of the streams flow through several counties; consequently, water right filings on these inter-county streams are found distributed in two or more county courthouses. Anyone desirous of determining appropriations on a certain river or creek finds it difficult and expensive to examine records in several places. In addition, the records are sometimes scattered because the original nine counties of 1865 have now increased to 56. As the original counties have been divided and sub-divided, the water right filings have frequently not been transcribed from the records of one county to the other. Thus, a record of an early appropriation in what is at present Powell County may be found in the courthouse of the original Deer Lodge County.

It can be readily seen that this system of recording offers little protection to rights in the use of water until they are determined by an adjudication. In other words, an appropriator does not gain a

clear title to his water right until after adjudication and then the title may not be clear because the Montana system of determining rights is also faulty. In the first place, adjudications are costly, sometimes very costly when they are prolonged for years. It is estimated that litigation over the Beaverhead River, which has lasted more than twenty years, has cost the residents of the valley nearly a half a million dollars. In the second place, unless the court seeks the advice of a competent irrigation engineer, the adjudication may be based upon inaccurate evidence. In the third place, if some claimant has been inadvertently left out of the action, it is not final and may be reopened for consideration by the aggrieved party. Another difficulty arises in determining the ownership of a water right when land under an adjudicated stream becomes sub-divided in later years and the water not proportioned to the land by deed or otherwise. There is no provision made by law requiring the recording of specific water right ownership on deeds and abstracts.

The Legislative Session of 1957 passed Chapter 114 providing for the policing of water released from storage to be transmitted through a natural stream bed to the place of use. The owner of the storage must petition the court for the right to have the water policed from the storage reservoir to his place of use. If there are no objections, the court may issue this right and appoint a water commissioner to distribute the water in accordance therewith. This law applies only to unadjudicated streams.

Administration of water on an adjudicated stream is done by the District Court, but it has its drawbacks. The appointment of a water commissioner is often delayed until the shortage of water is acute and the court frequently finds it difficult to obtain a competent man for a position so temporary. The present administration of adjudicated streams which cross the county boundaries of judicial districts creates problems. Many of the water decrees stipulate head gates and measuring devices for proper water distribution, but in many instances the stipulation is not enforced, causing disagreement among the water users.

Since a water right is considered property and may be bought and sold, the nature of water requires certain limitations in its use. One of the major faults affecting a stream after an adjudication is the failure of the District Court to have some definite control over the transfer of water rights from their designated places of use. The sale and leasing of water is becoming a common practice on many adjudicated streams and has created serious complications. By changing the water use to a different location, many of the remaining rights along the stream are disrupted, resulting in a complete breakdown of the purpose intended by the adjudication. To correct this situation, legal action must be initiated by the injured parties as it is their responsibility and not the Court's.

At one time or another all of the other Western Reclamation States have used similar methods of local regulation of water rights. Now all of them except Montana have more or less abandoned these practices and replaced them by a system of centralized state control such as the one adopted by the State of Wyoming. The key characteristics of the Wyoming system are the registration of both the initiation and completion of an appropriation in the State Engineer's Office, the determination of rights and administration by a State Board of Control headed by the State Engineer. These methods give the Wyoming water users titles to the use of water as definite and defensible as those which they have to their land.

When Montana began to negotiate the Yellowstone River Compact with Wyoming and North Dakota in 1939, the need for some definite information concerning our water and its use became apparent. The Legislature in 1939 passed a bill (Ch. 185) authorizing the collection of data pertaining to

our uses of water and it is under this authority that the Water Resources Survey is being carried on. The purpose of this survey is six fold: (1) to catalogue by counties, in the office of the State Engineer, all recorded, appropriated and decreed water rights including use rights as they are found; (2) to map the lands upon which the water is being used; (3) to provide the public with pertinent water right information on any stream, thereby assisting them in any transaction where water is involved; (4) to help State and Federal agencies in pertinent matters; (5) to eliminate unnecessary court action in water right disputes; (6) and to have a complete inventory of our perfected water rights in case we need to defend these rights against the encroachments of lower states.

Ground water and surface water are often intimately related. In fact, it is difficult in some cases to consider one without the other. In times of heavy precipitation and surface runoff, water seeps below the land surface to recharge underground reservoirs which, in turn, discharge ground water to streams and maintain their flow during dry seasons. The amount of water stored underground is far greater at any given instant than the amount of surface water in Montana, and, without seepage from underground sources, it is probable that nearly all the streams in the State would cease to flow during the dry seasons.

It is believed that Montana's ground water resource is vast and only partly developed. Yet this resource is now undergoing a rapidly accelerating development as the need for its use increases and economical energy for pumping becomes available. Continued rapid development will undoubtedly cause waste and depletion of ground water in areas where it is not plentiful. Experience in other states has shown that once overuse of ground water in a specific area has started, it is nearly impossible to stop it, and may result in painful economic readjustments for the inhabitants of the area concerned.

Practical steps aimed at conserving ground water resources and correcting related deficiencies in surface water laws are necessary in Montana. Proposed ground water codes have been rejected by four sessions of the Montana Legislative Assembly, (1951, 1953, 1955, 1959) and proposed improvements of existing surface water laws have also failed to be enacted. The formulation and presentation of a workable ground water code, designed to protect and conserve Montana's ground water resources, to the next Legislature are essential if Montana is to avoid the problems that plague some of our sister states.

A ground water code must be based on full consideration of the intimate relation of ground water and surface water. A central filing office where all filings, well logs, and other records (past, present and future) for all water in use—ground or surface—should be provided for by any water code. Accurate records concerning water rights and amount of water available are essential in the administration and investigation of water resources. The availability of these records in a central office under the control of a responsible State agency will surely provide a stronger and more accurate basis for the negotiation of inter-state water compacts, as well as set up a means for the rapid evaluation of data for in-State litigation.

METHOD OF SURVEY

Water Resources data contained in Part I and Part II of this report are obtained from courthouse records in conjunction with individual contacts of landownership. A survey of this type involves extensive detailed work in both the office and field to compile a comprehensive inventory of water rights as they apply to land and other uses.

The material of foremost importance used in conducting the survey is taken from the files of the county courthouse and the data required includes: Landownership, water right records (decrees and appropriations), articles of incorporation of ditch companies and any other legal papers in regard to the distribution and use of water. Deed records of landownership are reviewed and abstracts are checked for water right information when available.

Aerial photography is used by the survey to assure accuracy in mapping the land areas of water use and all the other detailed information which appears on the final colored township maps in Part II of the report. Section and township locations are determined by the photogrammetric system, based on government land office survey plats, plane-table surveys, county maps and by "on the spot" location during the field survey. Noted on the photographs are the locations of each irrigation system, with the irrigated and irrigable land areas defined. All the information compiled on the aerial photo is transferred and drawn onto a final base map by means of aerial projection. From the base map color separation maps are made and may include three to ten over-lay separation plates, depending on the number of irrigation systems within the township.

Field forms are prepared for each landowner, showing the name of the owner and operator, photo index number, a plat defining the ownership boundary, type of irrigation system, source of water supply and the total acreage irrigated and irrigable under each. All of the appropriated and decreed water rights that apply to each ownership by the description of intended place of use are listed on the field form. During the field survey, all water rights listed on the field form are verified with the landowner. Whenever any doubt or complication exists in the use of a water right, deed records of the land are checked to determine the absolute right of use.

So far as known, this is the first survey of its kind ever attempted in the United States. The value of the work has become well substantiated in the counties completed to date by giving Montana its first accurate and verified information concerning its water rights and their use. New development of land for irrigation purposes by State and Federal agencies is not within the scope of this report. The facts presented are as found at the time of completing each survey and provide the items and figures from which a detailed analysis of water and land use can be made.

The historical data contained in these reports can never become obsolete. If new information is added from time to time as new developments occur, the records can always be kept current and up-to-date.

Complete data obtained from this survey cannot be included in this report as it would make the text too voluminous. However, if one should desire detailed information about any particular water right, lands irrigated, or the number and amount of water rights diverting from any particular stream, such information may be obtained by writing the State Engineer's Office in Helena.

HISTORY AND ORGANIZATION

By Fred E. Buck

The name Missoula originates from the Flathead Indian tongue. Due to the fact that the guttural language of the tribe is difficult to transcribe into English spelling there are several different interpretations of the spelling. The one that seems to be the most accepted is "im-i-sul-e-eliku." The word refers to Hellgate Canyon just east of Missoula which was always considered a place of ambush. The French-Canadian early settlers translated the word as meaning the "Gates of Hell." In the early days the Flatheads travelled through this canyon to hunt in the buffalo country east of the mountains, and the Blackfeet Indians often came into the canyon to ambush the Flatheads and steal their horses. As a result, many minor skirmishes took place between the two tribes which resulted in giving the canyon the name of Hell Gate.

The early history of Missoula County is so closely allied with that of Ravalli County, which was a part of Missoula County until 1893, that it is hard to divorce one from the other. (Reference is hereby made to the early history contained in the Water Resources report for Ravalli County). There were no political boundaries between the two counties when the fur traders and Indians passed back and forth, Lewis and Clark came into the country, and the missionaries established the Missions.

Considering the state as a whole, Missoula County can boast of a good many "firsts" which took place about St. Mary's Mission and Fort Owen, which is now Ravalli County: It was the first settled community when St. Mary's Mission was established in 1841; the first agriculture was practiced here in 1842 when Father DeSmet returned from Fort Collins with potatoes and seeds which were planted at the mission; it was in this garden that the first irrigation was carried on by the Jesuit Fathers, although no official record was made of the water right; the first water right officially filed in the state was for lands around Fort Owen in 1852; in 1846 the first grist mill and saw mill were built at Fort Owen; the first real estate deal was made November 5, 1850, when Major John Owen purchased the original St. Mary's Mission site for \$250.00; the first orchard was planted by Major John Owen and Thomas Harris; the first gold in the state, in spite of the fact that Gold Creek in Powell County claims the honor, was found by Major John Owen on Burnt Fork Creek. Major Owen included in his diary of February 15, 1852, the following: "Gold hunting, found some." A few days later he mentioned in his diary that some gold was found on Mill Creek west of the Fort. This was six years prior to the finding of gold on Gold Creek, Powell County.

The area known as the Louisiana Purchase was acquired by France from Spain and the description of the area extended westward only to the crest of the Rocky Mountains. United States purchased the area from France and took possession on December 20, 1803. It was for the purpose of exploring the assets of this new purchase that Lewis and Clark were directed to make their trip to the Pacific Coast. The treaty with France did not specifically define the western boundaries of the area. Due to Lewis and Clark's Expedition the United States thereafter claimed the area to the Pacific Coast as a part of the Louisiana Purchase. When Oregon Territory was organized in 1843, Western Montana was included within the area. On December 14, 1860, Missoula County was formed from a part of Spokane County in Washington Territory; then, in 1863 it became a part of Idaho. When Montana Territory was organized in 1864, Missoula County, being one of the original nine counties of the territory, included all of the area west of the Continental Divide. The Montana Territorial Legislature on February 2, 1865, officially recognized Missoula County and named the town of Hellgate as the county seat. The original

county comprised an area of approximately 25,250 square miles or 17 per cent of the area of the territory. Since the other western counties have been formed, all that remains in Missoula County at the present time is about 2,624 square miles or $1\frac{3}{4}$ per cent of the area of the state.

The earliest inhabitants of the area were undoubtedly wandering Indian tribes who camped there in the summers and crossed the mountains to hunt in buffalo country. The Flatheads occupied both sides of the Continental Divide until about the year 1700 when they were gradually pushed westward by the more warlike Crows and Shoshones. Traditionally the Flatheads were very friendly to the white people. By the time Lewis and Clark came into the valley in 1805, the Indians were permanently settled in what is now Missoula and Ravalli Counties.

The first record of white man entering the area dates back to the Lewis and Clark Expedition. In their journey westward, they reached the head of Camp Creek, which is a tributary of the East Fork of the Bitterroot River, on September 4, 1805. There, they met a large camp of Indians where they stopped to trade and gather information. (The large painting by Charles M. Russell, which is on the wall behind the Speaker's desk in the State Capitol Building, Helena, depicts this meeting). On the 6th, Lewis and Clark started travelling down the Bitterroot Valley until reaching Lolo Creek on September 9, where they camped for a few days rest. This spot they named Travellers-rest. Comments made in their diaries in travelling down the valley were to the effect that the land was stony, covered with prickly pear, and that the river contained no fish, although it was beautiful country. On September 10 they sent a hunting party down to the mouth of the Bitterroot River, then broke camp on the 11th and started over the Lolo Trail for the Pacific Coast. On the return trip they reached Lolo Hot Springs on June 29, 1806, and the next day camped again at Travellers-rest. On July 3 the party was divided, Captain Clark taking part of the party, retraced their trail of the previous year as far as Three Forks and then went up the Gallatin River, crossed the divide and travelled down the Yellowstone. Captain Lewis took nine men and five Indians and started down the Bitterroot River. When they reached the mouth of the river the water was so high that they built three rafts to cross the Clark Fork and swam the horses. They camped that night about four miles west of the present city of Missoula and the next night camped on the Blackfoot River. Lewis' party crossed over the divide and went down the Missouri River meeting Captain Clark at the junction of the Missouri and Yellowstone Rivers. Clark reached there August 3 and Lewis, August 7, only four days apart.

Until 1840 only occasional trappers and traders came through the area. One of the earliest white men who came through the country after Lewis and Clark was David Thompson, who represented the Northwest Fur Company. He built the Salish House near Thompson Falls in 1809 and saw Mt. Jumbo near the present city of Missoula in 1812. The following British fur traders crossed the country at various times: Donald McKenzie, Alex Ross, Peter Ogden, and John Work. Among the American fur traders were Joshua Pilcher, Jededia Smith, and Jim Bridger. In 1812, Ross Cox made a trip for the Astor Pacific Fur Company, and that same year the western department of the American Fur Company was organized by John Jacob Astor. About 1824, serious competition between the Hudson's Bay Company and the American Fur Company started. Ten years later Astor sold out and the Hudson's Bay Company thereafter controlled the fur trade west of the mountains, while the American Fur Company became supreme east of the mountains with headquarters at Fort McKenzie near the mouth of the Marias River. In 1846, the Hudson's Bay Company established a trading post at St. Ignatius. Angus MacDonald, a stockholder of the Company, operated the post. His son was born there March 21, 1849, and was employed at the age of fifteen to trade with the Indians. He lived a colorful life and died at Thompson Falls on October 16, 1937.

The first permanent settlement was made when the Jesuit Fathers came into the Bitterroot and built St. Mary's Mission in 1841. The way this mission came to be built is rather interesting. A roving tribesman of Iroquois had told the Flatheads about the "black robes," and they became so interested that they sent four different expeditions to St. Louis to ask the Jesuit Missionaries to come to the Bitterroot country and establish a mission. The first expedition was in 1831, but it was not until 1840 that their wishes were gratified, when Father DeSmet set out and reached the tribes in the same year. After staying with them a few weeks he went back to St. Louis, promising to return. The following year Father DeSmet made the trip, arriving in the Bitterroot Valley on September 24, 1841, where he built St. Mary's Mission, the first in the territory. After completing the building Father DeSmet made a trip to Ft. Colville on the Columbia River to purchase farming tools, seeds, cattle and other livestock. The following spring a garden was grown and the first known irrigation in Montana was practiced. In 1854 the Jesuits founded a mission at St. Ignatius and in 1863, they built St. Michael's Mission at the town of Hellgate. As time went on through the 1840's there was a growing unrest between the Indians and the mission. Consequently, St. Mary's was closed in October, 1850; the assets sold to Major John Owen, and the mission was not reopened again until 1866.

Among the early travelers in the region was the Isaac I. Stevens' railroad survey party which arrived in the valley in the late summer of 1853 for the purpose of initiating a survey for a transcontinental railroad and establishing a supply depot. That fall, Captain John Mullan came for the purpose of surveying a military road from Ft. Benton to Walla Walla. Mullan returned to the region in 1858 and completed the road in 1862.

On July 16, 1855, a Treaty was negotiated between Governor Stevens of Washington Territory and the Confederated Salish and Kootenai tribes for surrender of their claims to lands in Western Montana in exchange for a reservation. On the demand of Chief Victor of the Flatheads, the 11th Article of the Treaty provided for investigation of the Bitterroot Valley as a reservation site, and if it proved to be more suitable than the proposed Jocko Reserve, another reservation would be created there for the Flatheads. The United States did not ratify the Treaty until 1859 and did nothing about surveying the alternate site. The Indians resisted the presidential order to move in 1871. The following year General Garfield met with the Indians and urged them to sign the Treaty, but it is alleged that failing in this, he forged Chief Charlot's name to the agreement to move to the Jocko Reserve. However, Arlee, second chief, and Adolph, third chief, did sign the Treaty and moved to the Jocko Valley in 1872, near the present town of Arlee. Chief Charlo always insisted that his name had been forged to the Treaty and resisted until 1891 when he and the balance of the Indians finally gave up on account of economic conditions and moved. In 1950, the Indians brought suit against the United States Government to reclaim the value of the lands given up by them. (Suit is still pending in 1960).

The town of Hellgate was established about 1860 on the north bank of Clark Fork River about four miles west of the present town of Missoula. It was at the intersection of the Mullan Road and the Indian trail crossing north and south which connected the Bitterroot Valley with the Flathead Valley. The town did not come into prominence until about June, 1860, when Frank J. Worden and C. P. Higgins, under the firm name of Worden and Company, brought in a pack train of supplies from Walla Walla and established a store for the purpose of trading with the Indians. To build the building they bought a set of cottonwood logs from David Patty, who had hewn out the same to construct a home for himself. The establishment of this trading post was a blow to Major John Owen who previously had enjoyed the entire trade at Fort Owen.

The settlement of Frenchtown was established in 1864 by a group of French-Canadians who had migrated from Canada. The first farming in the county began in 1865 at Frenchtown and about the same time C. P. Higgins excavated a ditch from the Clark Fork River and irrigated a small ranch in South Missoula.

When twenty-five men organized the Vigilantes in Virginia City on December 23, 1863, to clean up the road agents who had been holding up the gold miners, they executed thirteen at Virginia City, Bannack and vicinity. Others who were not caught at the time scattered westward and were followed by twenty-one members of the Vigilantes who caught and hanged one outlaw on the Big Hole River, another at Deer Lodge, and six in Missoula County. In Higgins corral in the new town of Hellgate they hanged Cyrus Skinner, Alec Carter, Johnny Cooper, and Bob Zachary. At Frenchtown they hanged George Shears in Van Doren's barn, then caught "Whisky" Bill Graves at Fort Owen and hanged him in Pine Hollow about three miles south of Stevensville. By February 3, 1865, they had hanged a total of twenty-one outlaws.

The town of Hellgate flourished until 1864-65 when Worden and Company built a sawmill and grist mill and moved their store from Hellgate to the present location of Missoula. The new town was first called Missoula Mills, but finally the last word was dropped. E. L. Bonner and D. J. Welsh established the second store at Missoula in 1866. This passed into the ownership of R. A. Eddy and A. B. Hammond ten years later, and eventually became the Missoula Mercantile Company. In 1866, the county seat was moved from Hellgate to Missoula.

The last notable Indian incident occurred in 1877 when Chief Joseph and his tribe of Nez Perce Indians came into Missoula County while fleeing from General Gibbon. The Indians crossed the mountains from Idaho to the head of Lolo Creek, thence followed down the valley in the latter part of July. Captain C. C. Rawn, with a force of troops from Fort Missoula and a few civilians, attempted to stop the Indians at Fort "Fizzle," a few miles above the mouth of the creek, but was unsuccessful. On July 28, Chief Joseph started up the Bitterroot and camped two days to trade at Stevensville. The Indians then moved on to the Big Hole Valley where, on the morning of August 9, General Rawn with a command from Fort Shaw, together with thirty-four volunteers from the Bitterroot Valley, charged the Indian camp. The battle lasted two days and two nights; 29 men were killed and 40 wounded. Eighty-nine Indians were killed but there is no record of the number wounded. Chief Joseph was headed for Canada but when he reached the Bear Paw Mountains in the late fall, he was intercepted by General Nelson A. Miles, who had arrived from Miles City. Miles and Joseph parleyed for five days and finally Chief Joseph surrendered and was taken to Kansas.

In the early years most of the traffic was moved over the Mullan Road which extended from Fort Benton to Walla Walla. The Union Pacific Railway was completed into Silver Bow Junction in 1869, which moved the railroad head much closer to Missoula. Prior to that, freight was hauled by teams from Corinne, Utah. The first railroad to go through Missoula was the Northern Pacific, which reached Miles City in 1881 and was completed in 1883. Four years later a branch line was built up the Bitterroot Valley from Missoula. In 1887, the Manitoba Railway (now the Great Northern) reached eastern Montana and was completed in 1893. During construction of the road, the town of Ravalli on the Northern Pacific Railway was the principal supply point for the Great Northern. In 1906, the Chicago, Milwaukee & St. Paul Railroad reached Montana and was completed in 1909. In 1916 it extended a branch line from Bonner up the Blackfoot River for the purpose of logging.

After the Custer Battle in 1876, the populace around Missoula became apprehensive that there might be Indian troubles, although the Flatheads were very friendly. As a result of this, Fort Missoula was built in 1877, the year of the Nez Perce Indian migration through the Bitterroot Valley.

During the time of John E. Rickards term as Governor of Montana, the State Legislature in 1893 founded the Board of Education and laid plans for constructing the State University of Montana at Missoula. The first classes were held in 1895 in an old brick school building on the south side of the river immediately west of the Bitterroot railroad track. On June 8, 1898, the cornerstone was laid for the main building at the present University site, and classes were commenced that fall.

The first newspaper in the county was called the "Missoula-Cedar Creek Pioneer," established September 15, 1870. On November 2, 1870, it was changed to "The Pioneer" and on February 8, 1873, the paper became "The Missoulian."

The advancement in civilization, and modern highways obliterating old Indian trails, have confined the Indians to the limits of their own reservation. In the past, Missoula and the Bitterroot Valleys were very colorful with many Indians, their camps and cayuses. That time has passed. An Indian is seldom seen there any more. In the early spring the flat between Missoula and the Fort was covered with teepees where the Indians were digging bitterroots for food and medicine. The thin brown skin was washed from the white roots which were then spread out on blankets and dried. The vacant blocks around the center of Missoula were always filled with Indians who came to town to trade. After the Northern Pacific Railway was built, the depot bristled with Indians dressed in their colorful blankets selling moccasins, beaded garments, headbands, bags made of buckskin, and hatracks made of horns. All his worldly goods were transported by travois; his horses were all skinny cayuses; the bucks rode bareback with a short rope or buckskin thong looped around the cayuse's lower jaw to guide him; the squaws often rode in saddles made of bone and rawhide and often she carried a papoose (baby) in a cradleboard hanging along the side or strapped to her back. Yes, civilization and the passing of time have changed their habits. No longer are there many old pioneers left who remember the customs and the habits of early day Indians around the Missoula and Bitterroot Valleys.

A few of the pioneers around Missoula, in addition to those already mentioned, were: Miss Emma Slack (Mrs. W. H. Dickinson) was the first school teacher in Missoula when school opened in 1869; Higgins and McCormick platted part of Missoula, which is now in the heart of the city; Captain John B. Carlin led the volunteers in the Big Hole Battle; Will Cave, born at Cedar Creek, was an early day historian; Wm. H. Houston was the first sheriff after Montana became a state on November 8, 1889, and executed four Indians in Missoula on December 19, 1890; Wolf and Rhyman were both early bankers; Judge Woody was a famous judge of the district court; E. S. Paxon became a famous artist, some of his paintings decorating the courthouse in Missoula and the State Capitol building in Helena; C. H. McLeod was manager of the Missoula Mercantile Company; J. C. Keith was a banker; Henry Meyers was one of the first postmasters; and there were many others. Among the politicians serving in the United States Congress from Missoula were: Joseph M. Dixon, Representative from 1903 to 1907, and Senator from 1907 to 1913; John M. Evans, Representative from 1913 to 1920, and 1923 to 1933; Jeannette Rankin, Representative from 1917 to 1919, and 1941 to 1943; W. J. McCormick, Representative from 1921 to 1923; Mike Mansfield, Representative from 1943 to 1953 and Senator from 1953 to date; Joseph M. Dixon was Governor of Montana from 1921 to 1925, and Jeannette Rankin was the first woman ever to serve as a Representative in the Congress.

CLIMATE

Although situated some distance west of the summit of the Continental Divide, Missoula County is very mountainous, and well over 25 miles of the southwestern county boundary lies along the summit of the Bitterroot Divide. The county's valleys are well marked, and the rugged topography contributes to a wide range of climatic conditions, not only between valley and mountain, but between adjacent valleys and between mountain slopes, both lee and windward, and across a valley. The more important valleys are those of the Bitterroot River, entering the county south of Missoula, the Clark Fork, entering the county southwest of Missoula, the Blackfoot River, which flows into Clark Fork at Milltown, the Swan River, which flows northward into Lake County, and the main valley of the Clark Fork which extends west-northwestward through Albion into Mineral County. Elevations range from about 3,000 ft. above mean sea level where the Clark Fork leaves the county to over 10,000 ft. on some of the higher Mission Range peaks in the northern part of the county. The location of the county between Bitterroot and Continental Divides produces a climate classification neither continental nor maritime, as both types of weather occur and can prevail for several days at a time. Probably the climate is closer to the Pacific maritime type most of the time.

Valley locations generally have warmer average annual temperatures than most Montana stations, largely because many of the winter polar cold air invasions that penetrate the area East of the Continental Divide do not extend as far west as Missoula County. However, there are exceptions in most of the higher valleys, such as at Seeley Lake on the Swan River in the north part of the county (elev. 4,030 ft.), where temperatures average between 4° and 5° cooler throughout the year than at locations in and around Missoula. As in most of Montana, the wettest month of the year is June, but May averages nearly as wet, and seasonal variations are much smaller than in most counties East of the Continental Divide. Valley precipitation and snowfall are about the same, considering average annual totals, as for most of the Western Montana mountain country, but the variations between valley and mountain, and between lower and higher valleys, are generally large. While precipitation averages only around 13 inches annually around Missoula, nine seasons of precipitation at Upper Holland Lake (northeastern corner of the county, elev. 6,000 ft.) have averaged nearly 65 inches, and it seems likely that larger totals fall in the mountains in some sections.

By seasons, spring and early summer are generally cool and cloudy, with fairly frequent but seldom heavy rains over most valleys, but with snows over the higher mountains sometimes occurring as late as early July. Late summer and early fall are usually characterized by clear skies and warm days, interrupted occasionally by afternoon showers or thunderstorms. Mountain areas receive their first snowfall generally before the end of September, and the fall season is marked by considerable cloudy, damp, and sometimes foggy weather. Late fall and early winter usually finds snowfall beginning to accumulate in mountain areas, and winter and early spring precipitation falls almost totally as snow above about 4,500 ft. above sea level. These mountain snows are heavy at times, and result in sufficient snowpack storage almost every year to produce near bankfull runoff in all streams at times during late May and early June.

At Missoula (a fairly typical lower valley site), the sun shines 53 per cent of the time during an average year, ranging from 25 per cent of the time during December (also the cloudiest month) to 78 per cent in July (clearest month). Cloudy days number 207 during an average year, partly cloudy and clear days, 138. Temperatures lower than zero are observed on 13 dates of a normal year, and warmer than 90° weather is observed on 18 days a year. Maximums as warm as 100° occur only

in lower valleys, and even there average less than one occurrence a year. Average early morning relative humidity is 81 per cent, ranging from 73 per cent in August to 86 per cent in November. Late afternoon humidities average 51 per cent, ranging from 28 per cent in August to 78 per cent in December. The frost-free period for the county varies from only a few days in some of the higher valleys to as much as about 130 days in the Clark Fork Valley from Missoula west.

Although the weather can become very cold at times when Arctic air invasions reach as far west as Missoula County, the local winds of the "Hellgate" type can become strong at times, very little really severe weather is observed in the county. Missoula's average wind speed, for example, is only 5.9 miles per hour—one of the lowest in the U. S. Thunderstorms during summer months sometimes "kick up" energetic squalls, and hail has been observed, but it is seldom large enough or sufficiently widespread to cause much damage. Listed below is a tabulation of some of the weather data observed in and near Missoula County over the years:

MISSOULA COUNTY WEATHER DATA

STATION	YEARS OF RECORD	AVERAGE ANNUAL TEMP.	HIGHEST	LOWEST	YEARS OF RECORD	AVERAGE ANNUAL PRECIP.	WETTEST	YEAR	DRIEST	YEAR
Fort Missoula	5 ¹	42.4	101	-27	12 ²	14.21	22.43	1891	7.80	1888
Missoula 205 5th Street	25 ³	44.9	103	-28	35 ⁴	14.33	21.41	1927	8.16	1931
Missoula Weather Bureau Office Higgins Avenue & Broadway	8 ⁵	47.0	105	-26	8	13.31	15.79	1941	10.34	1937
Missoula 2 WNW	29 ⁶	45.5 ¹³	103	-30	29	12.56 ¹³	17.23	1955	6.71	1935
Missoula WBAS	14 ⁷	44.1	105	-33	14	13.12	16.98	1958	8.62	1952
Seeley Lake	19 ⁸	40.9	101	-53	20 ⁹	20.54	27.04	1951	14.00	1952
Upper Holland Lake ¹¹ Storage Gage	—	—	—	—	9 ¹⁰	64.46	79.05	1958- 1959	55.55	1954- 1955
Ovando 1 SW (a)	59 ¹²	39.3 ¹³	101	-52	59 ¹²	15.85 ¹³	25.44	1910	10.54	1935

(1) 1892-1897 (2) 1886-1897 (3) 1899-1934 (4) 1899-1934 (5) 1936-1943 (6) 1930-1958 (7) 1945-1958
(8) 1937-1958 (9) 1937-1958 (10) 1949-1959 (Seasonal totals from about 7/10-7/10 annually). (11) No Temperature Record. (12) 1900-1958 (13) Average 1931-1955.

(a) Included as a second example of higher valley conditions (elev. 4,100 ft.), although this station is situated just across the eastern boundary, in Powell County, and on the Blackfoot River.

SOILS

Missoula County lies in the Columbia Basin of Western Montana. Most of the county is drained by the Clark Fork River and its tributaries with a small portion draining northward into the Swan River which drains directly into Flathead Lake. Physiographically the county consists of high mountains with wide sediment filled valleys. Sediments in the valleys consist of materials deposited by glaciers and alluvium deposited by streams. Glacial deposits are most extensive in the northeastern part of the county but such deposits are common in several locations in the county.

Factors that influence the formation of soils are character of parent materials, topography, climate, vegetation, and the length of time in which soils have been forming. Since all these factors are varied in Missoula County, a large number of different soils are found. The geologic materials include granite, rhyolite, basalt, argillite, quartzite, limestone, sandstone, and unconsolidated alluvial or glacial deposits reworked from these bedrock materials. The farming soils and many of the grassland soils are developed in the unconsolidated alluvial and glacial deposits. These vary in character, ranging from clays to coarse gravelly or cobbly materials. Some grassland soils and many of the forested soils are developed "in place" from the underlying hard rock. Such soils generally are somewhat limited in depth to which plant roots can penetrate, in their capacity to store water, and are deficient in plant nutrients.

Silt loam and clay loam textures predominate, but some clay and some sandy soils are found and there are many areas where mixtures of gravel and sand or cobbles and sand occur at shallow depths. Soils along the larger stream valleys are comparatively free of stone on the surface, but many soils in the smaller tributary valleys and along the outer fringes of larger valleys are too stony for cultivation.

Soils of the grasslands and most farming areas belong in the Chestnut and Chernozem Zonal groups with significant inclusion of Regosols, Lithosols, and Alluvial soils, and with a few small areas of Humic Gley (wet) soils. Soils which were developed under conifer forests are in the Grey Wooded and Podsol great soil groups. Some of these soils have been cleared of timber and are being used for farming.

A detailed soil survey is now being made in Missoula County. When it is completed, the survey will be published. The published map will show locations of the different kinds of soils and the differences among soils found in the county will be described in detail in the soil survey report.

SOURCES OF WATER SUPPLY

The drainage area of Missoula County consists of the Clark Fork River and tributaries. This stream and its tributaries are located on the Pacific slope of the Rocky Mountains in the Columbia River Basin watershed. Streams which are the largest contributors of water for irrigation in the county are: Clark Fork River, Elk Creek, Union Creek, Grant Creek, Bitterroot River, Carlton Creek, Lolo Creek, Miller Creek, Nine Mile Creek, Stony Creek, and the Jocko River. Each of the above named rivers and creeks supply water for the irrigation of 500 or more acres of land, with the main stem of the Clark Fork River furnishing water for approximately 12,000 acres.

In Montana, whenever a shortage of water occurs on a stream and the water users find it necessary to settle their disputes, the action is brought into court in what is called an adjudication by decree of

that stream. The results of the court decree establishes the use in the amount of water and the date of priority of each water user on the stream.

The streams in Missoula County which have established decreed water rights by adjudication proceedings are as follows: Cramer, Smith, Dirty Ike, Turah, Deer, Cottonwood, Elk, Union, Camas, Ashby, Arkansas, Blixit, Nelson, Demmons, Rattlesnake, Coal, A Spring (trib. to Rattlesnake Cr.), Grant, Carlton, Lolo, Granite, South Fork Lolo, Mill (trib. to Lolo Cr.), Johnny, Mormon, Miller, Underground Water (trib. to Bitterroot River), O'Brien, O'Keefe, Mill (trib. to Clark Fork River), Nine Mile, Burnt Fork, Bird, Big Pine, Nowlin, Kennedy, Cedar, Rock, and Finley Creeks. Reference is made to the Water Right Data in this report for the listing of adjudicated streams, by case number and number of decreed water rights as determined by the court.

STREAM GAGING STATIONS

The U. S. Geological Survey measures the flow of streams, co-operating with funds supplied by several State and Federal agencies. The results are published yearly in book form as Water-Supply Papers, the latest being for the year 1958. The later records may be obtained prior to publication from the U. S. Geological Survey. That agency's records and reports have been used in the preparation of this resume.

Data given below cover the stream gaging records which are available for Missoula County from the beginning of measurements through the water year 1959. The water year begins October 1 and ends September 30 of the following year.

The irrigated acreage figures shown for ditch diversions above the gages are taken from the final results of the Water Resources Survey for the active gaging stations operating at the present time. For the gaging stations now discontinued, the acreage figures above the gage were estimated by the Geological Survey at the date of operation.

Following are equivalents useful in converting from one unit of measurement to another:

- (a) In Montana, one cubic foot per second equals 40 miner's inches.
- (b) One acre-foot is the amount of water required to cover an acre one foot deep.
- (c) One cubic foot per second will nearly equal two acre-feet (1.983) in 24 hours.
- (d) A flow of 100 miner's inches will equal five acre-feet in 24 hours.
- (e) One miner's inch flowing continuously for 30 days will cover one acre 1½ feet deep.

For reference purposes, the stream gaging stations are listed in downstream order.

Clearwater River at Clearwater (Discontinued)

The wire-weight gage was 400 feet upstream from the mouth and 1 mile south of Clearwater Post Office. The drainage area is 391 square miles. Records are available for June-Oct., 1921, May-Nov., 1922 and May-Sept., 1923. The maximum discharge observed was 2,400 cfs (May 26, 1922) and the

minimum observed was 30 cfs (Oct. 23 to Nov. 21, 1922). There are a few small diversions above the station for irrigation.

Blackfoot River at Clearwater (Discontinued)

The wire-weight gage was 200 feet upstream from the bridge on Missoula-Ovando road, 300 feet upstream from Clearwater River, and 1 mile south of Clearwater Post Office. The drainage area is 1,550 square miles. Records are available for June-Oct., 1921, May-Nov., 1922 and May-Sept., 1923. The maximum discharge observed was 7,820 cfs (June 6, 1922) and the minimum observed was 410 cfs (Nov. 13-21, 1922). There are diversions for irrigation of approximately 30,000 acres above the station.

Blackfoot River near Potomac*

The water-stage recorder is an eighth of a mile upstream from Belmont Creek and 5 miles north of Potomac. Records are available from Oct. 1956 to date. The maximum recorded discharge was 10,900 cfs (June 15, 1959) and the minimum daily 300 cfs (Jan. 4, 1958). An estimated discharge of about 17,000 cfs was made from flood marks of June, 1953. There are diversions for irrigating 26,456 acres above the station.

Blackfoot River near Bonner*

The water-stage recorder is 5 miles northeast of Bonner, 5 miles downstream from Union Creek, and 7 miles upstream from the mouth. The drainage area is 2,290 square miles. Records are available from July to Sept. 1898, Mar. 1899 to Sept. 1901, May 1903 to Oct. 1905 and Oct. 1939 to date. Records prior to Oct. 1, 1955 were at sites 7 miles and 1.3 miles downstream. The maximum discharge was 18,300 cfs (June 4, 1953) and the minimum daily 200 cfs (Jan. 4-5, 1950). The average discharge for 23 years (1899-1901, 1903-4, 1940-59) was 1,605 cfs or 1,162,000 acre-feet per year. The highest annual runoff was 1,600,000 acre-feet (1951) and the lowest 403,900 acre-feet (1941). There are diversions for irrigating 29,522 acres above the station.

Clark Fork River above Missoula*

The water-stage recorder is 3 miles downstream from Blackfoot River and 3 miles east of Missoula. The drainage area is 5,999 square miles. Records are available from March 1929 to date. The maximum discharge was 31,500 cfs (May 23, 1948), the minimum 115 cfs (Oct. 25, 1943, power plant shut down) and minimum daily, 340 cfs (Sept. 27, 1937). The average discharge for 30 years was 2,815 cfs or 2,038,000 acre-feet per year. The highest annual runoff was 3,084,000 acre-feet (1951) and the lowest 973,200 (1941). Diurnal fluctuations are caused by the power plant at Bonner. There are diversions for irrigating 135,797 acres above the station.

Rattlesnake Creek at Missoula*

The wire-weight gage is on Vine Street Bridge in Missoula, half a mile upstream from the mouth. The drainage area is 79.7 square miles. Records are available from June to Dec. 1899 and April 1958 to

date. The maximum discharge observed was 2,050 cfs (June 18, 1899) and the minimum 3.2 cfs (Aug. 30, 1958). There are diversions above the station for the irrigation of 294 acres and a diversion for Missoula municipal water supply.

Clark Fork River at Missoula (Discontinued)

The wire-weight gage was about 400 feet upstream from the Northern Pacific Railway bridge. Prior to May 27, 1899 a staff gage three-quarters of a mile upstream was used. The drainage area is 6,084 square miles. Partial records are available for July 1898 to June 1907 with many winter months missing. The maximum discharge was 36,400 cfs (June 20, 1899) and the minimum observed was 455 cfs (Feb. 17, 1900). There was slight regulation by the power plant at Bonner and many small diversions above the station for irrigation.

Lolo Creek near Lolo (Discontinued)

The staff gage was on a bridge abutment 6½ miles west of Lolo and 7½ miles upstream from the mouth. The drainage area is 231 square miles. Records are available from May, 1911 to Nov. 1914 with most of the winter months missing. The maximum discharge observed was 2,500 cfs (May 28, 1913) and the minimum observed 33 cfs (Dec. 21, 22, 24 and 26, 1911, but may have been less during winter months). Flood of May-June, 1948 reached a discharge of 1,460 cfs, from determination of flow over a dam about 4 miles upstream. There were small diversions for irrigation above the station.

Lolo Creek above Sleeman Creek, near Lolo*

The water-stage recorder is 3 miles west of Lolo and 4 miles upstream from the mouth. The drainage area is 250 square miles. Records are available from Nov. 1950 to date. The maximum discharge was 2,430 cfs (May 24, 1956) and the minimum 6.3 cfs (Nov. 9, 1952). The average discharge for 8 years (1951-58) was 218 cfs or 157,800 acre-feet per year. The highest annual runoff was 220,800 acre-feet (1956) and the lowest 108,600 acre-feet (1953). There are numerous small diversions above the station for the irrigation of 2,429 acres.

Bitterroot River near Missoula (Discontinued)

The chain gage was on a bridge 4 miles southwest of Missoula and 5 miles upstream from the mouth. The drainage area is 2,812 square miles. Intermittent records are available from July 1898 to Dec. 1904. The maximum discharge observed was 28,300 cfs (June 20, 1899) and the minimum 370 cfs (Sept. 16-29, 1904). There were many diversions for irrigation above the station (about 17,000 acres in 1890, about 73,000 in 1900, and about 100,000 acres in 1905).

Clark Fork River below Missoula*

The water-stage recorder is 2 miles downstream from the mouth of the Bitterroot River and 5 miles west of Missoula. The drainage area is 9,003 square miles. Records are available from Oct. 1929 to date. The maximum discharge was 52,800 cfs (May 23, 1948) and the minimum 388 cfs (Jan. 18, 1933). The average discharge for 30 years was 5,164 cfs or 3,739,000 acre-feet per year.

The highest annual runoff was 6,065,000 acre-feet (1948), and the lowest was 1,869,000 acre-feet (1937). There are diversions for irrigation of 249,570 acres above the station.

Clark Fork River near Alberton*

The water-stage recorder is about 400 feet upstream from the remains of a county bridge a quarter of a mile upstream from Petty Creek and 1¾ miles east of Alberton. Records will be available from June 1959 to date. Records are required for hydrologic research.

Miscellaneous Discharge Measurements

Measurements of discharge at points other than regular gaging stations are made occasionally. These are reported in annual Geological Survey Water-Supply Papers in lists at the end of each report.

*These gaging stations are now in operation (1960).

MINING

The following summary on mines and mineral deposits of Missoula County is a condensation of "Mines and Mineral Deposits," Missoula and Ravalli Counties, Montana.*

Missoula County, unlike most other western Montana counties, was first settled because of rich farming lands, whereas mining was predestined to be a secondary factor in the County's settlement and development. It was not until the political area now known as Missoula County became part of the Montana Territory (organized May 26, 1864) that active mining came into prominence. The County had previously been a part of Oregon Territory, Washington Territory, and Idaho Territory.

The earliest recorded metal discovery was on Elk Creek in the eastern part of the County. It was the site of a placer gold discovery sometime after 1865. By 1869 a reported \$500,000 in placer gold had been recovered from this creek and its tributaries. Annual production records report almost continuous placer gold production from Elk Creek up to 1948.

Although it is difficult to trace the development of mining during the early day rushes, it is reasonably safe to assume that precious metal-bearing placers were the first sought-after deposits. So it was that rich gold-bearing gravels were discovered along Nine Mile Creek and its tributaries; St. Louis and Eustash Gulch, in the northwestern part of the County. Some placer claims yielded as high as \$100 per day "to the hand" (panning). At that time gold from the Nine Mile district was valued at \$20.50 to \$21.25 per ounce.

Lode mining, first for precious metals and then for base metals, followed in the wake of placer mining. Silver-bearing quartz veins were discovered along Wallace Creek, east of Missoula, where surface exposures were reported to contain 20 ounces of silver to the ton. Several properties in the Wallace area reported assays with as much as 400 ounces of silver to the ton. Lode discoveries on Nine Mile and Elk Creeks probably coincided with or occurred shortly after the placer finds.

*U. M. Sahinen, 1957, Mines and Mineral Deposits, Missoula and Ravalli Counties, Montana Bureau of Mines and Geology Bulletin 10, 68P.

Base metal deposits carrying precious metals were then opened in the Garnet Range. The Coloma, Copper Cliff, and Clinton (Wallace) districts became centers of activity. The Lolo Creek copper-gold deposits were opened about the same time.

Missoula County is presently following a current trend in mining—the trend toward a greater production of nonmetallic minerals, such as sand and gravel and barite. Deposits of asbestos, coal, clay, and pumicite are also known within its boundaries.

From 1904 to 1958 Missoula County has produced about \$3,270,000 worth of gold, silver, copper, lead, and zinc. Production values of nonmetallic minerals are probably sizeable but are not known.

In terms of recoverable metals, total production of Missoula County between 1904 and 1958 has been: 36,300 ounces of gold, 141,400 ounces of silver, 700,200 pounds of copper, 3,421,500 pounds of lead, and 155,300 pounds of zinc.

The geologic picture of the County is similar to that of its neighboring counties. Lying within the Rocky Mountain Physiographic Province, it has been subjected to intense mountain building, erosion, scouring by glaciers, and inundation by glacial lakes. Figuratively, from a glance at the geologic map, one might associate its history with a hypothetical person whose life had changed from youth to old age without the benefit of maturity. Actually the impression is only surficial. The major portion of the County is underlain by slates, quartzites, dolomites, and marbles of the Precambrian Belt series. Cambrian sediments are exposed in the southeastern part of the County, but the mature years, the Paleozoic and Mesozoic, seem to have passed by without leaving their mark. However, Paleozoic limestones, shales, and quartzites are exposed in a relatively small area in the northwestern corner of the Garnet Range. Undoubtedly, rocks of both ages were widespread at one time, but erosion removed all but a few minor occurrences leaving exposed only the underlying formations. The Cretaceous and Tertiary periods were marked by the intrusion of the Idaho batholith and outliers of the Boulder batholith. Tertiary lake bed sediments and recent gravels fill most of the larger valleys.

If one could travel back through the pages of time, the sight of an enormous lake filling the Missoula Valley would probably be a very impressive picture. For during the Pleistocene epoch this great Lake Missoula was formed by the glacial damming of the Clark Fork River near the Montana-Idaho line. The ice formed a dam 2,000 feet high and it is estimated that impounded water spread over an area of 3,300 square miles. Parts of Sanders, Lake, Mineral, Missoula, and Ravalli Counties were inundated. Shoreline terraces can still be seen on hillslopes near Missoula—notably on the grassy slopes of Mount Jumbo. Glacial debris fills many of the valleys tributary to the Clark Fork River.

Metallic mineralization was, most likely, associated with intrusions of granite rocks. Deposits of copper-gold ores are found near Lolo near the Idaho batholith whereas lead-silver and copper-gold ores are found near and in granodiorite intrusives north and west of Clinton and in other parts of the Garnet Range.

Metal Mining Districts

Clinton (Wallace) and Potomac.—Wallace Creek and its tributaries form an inner network of the Clinton district whereas the Potomac district encompasses an area at the headwaters of Ashley Creek. Both districts are accessible from Clinton.

Mining has been the most intensive near the contact between a northeasterly trending granodiorite stock and quartzite beds of the Precambrian Missoula group. Ore bodies, though occurring in both granodiorite and quartzite, are of better grade in the sedimentary rocks. Copper is the principal metal in the Clinton district, but lead and silver are more abundant in the ore of the Potomac district. As in most mining districts, metal mining has gradually diminished. However, since the initial discoveries in the 1870's and prior to World War II, the Hidden Treasure, Cape Nome, and Triangle mines were substantial producers of copper-gold ore. The Hobo and the Shawbut mines produced lead and silver.

Very little mining has been carried on in the area since 1950. Development work was being carried on at the Hidden Treasure in 1959 and a few shipments of copper ore were made from the mine in 1958. In 1956 the Charcoal mine shipped gold-silver ore.

Coloma District.—Gold mines were once active on the Plateau-like crest of the Garnet Range in an area drained by McGinnis Creek and its tributaries. This is the Coloma district which is accessible from Bearmouth, to the south, and from Greenough, to the north.

Narrow but extensive gold-bearing veins occur mostly in a granodiorite intrusive body near the contact with limestones of Paleozoic age. Most ore mined was oxidized gold ore carrying from \$20 to \$100 per ton in gold. Sulfide ores, encountered at depth in most mines, contained pyrite, chalcopyrite, and tetrahedrite. Major producers were the Mammoth, with an estimated production of \$200,000 in gold and the Clemantha which produced over \$30,000 in gold. The Comet, Cato, Dixie, Mountain View, Arm & Hammer, North Star, and Bullion also recorded production. Other than development work at the Crystal Springs mine, there has been very little activity in this district in recent years.

Copper Cliff.—This district receives its name from a multicolored cliff near the head of a tributary of Union Creek in the Garnet Range. The 150-foot high quartzite cliff is streaked with blue, green, yellow, and white. Yellow lichens, pale-blue to dark bluish-green copper phosphate and white aluminum phosphate comprise the color scheme.

Quartzite is the predominant country rock, but limestones of probable Paleozoic age occupy a portion of the area. The limestones occur in down-dropped fault blocks between masses of Precambrian quartzites. Ore bodies are associated with crushed zones between the several large faults.

The Copper Cliff mine was the most extensively developed property in the district. Ore shipments made in the 1900's contained 9.5 to 22 percent copper and 0.5 to 1.0 ounce of silver to the ton plus a little gold. Twenty-one carloads of ore carrying 7 to 10 percent copper were shipped to smelters from the Leonard (Blue Bell) mine in 1916. The Leonard is about 1,500 feet south of the Copper Cliff. Galena (lead sulfide) and cerrusite (lead carbonate) ores have been shipped from the Blacktail mine on Cramer Creek, which was operated from 1947 through 1956. Several lead ore shipments are recorded from the Chlorite property, 3 miles southwest of the Cliff. The Arrowhead, one mile north of Bonita, shipped manganese oxides during 1917 and 1918 and again in 1956.

Elk Creek.—Elk Creek and its tributaries have produced sizeable amounts of placer gold since initial discoveries in the late 1860's. Narrow but persistent gold-bearing quartz veins are undoubtedly the source from which placer deposits derived their precious metal content. The veins which were subsequently located as lode mines are in Precambrian sediments and in a small granodiorite stock. The most active lode mines were in the Day Gulch area and of these the Dandy mine was probably the larg-

est producer. There is no recorded production for the Dandy since 1941. Other mines, the Ohio and Buckeye, Haparanda, Masculine and Arkansas, and the Morse and Kennedy have not produced for many years.

Nine Mile.—The Nine Mile district is in northwestern Missoula County and includes the drainage system of Nine Mile Creek and its tributaries. Placer deposits, discovered about 1874, have been worked on Kennedy, Josephine, Pine, Marion, McCormick, and Nine Mile Creeks and in St. Louis, Eustash and Dry Gulches. From 1908 to 1955 the total production from this district was over \$480,000, almost entirely in gold. The last recorded placer gold production came from the LaChambre placer mine in 1956.

Deep mines are on upper Kennedy Creek and near the head of Nine Mile Creek. The Nine Mile, operated on a small scale in 1956, and San Martina mines have produced gold ore from flat-dipping quartz veins in Belt argillites. Barite is also found in the ore and caused considerable trouble in early milling processes by scouring amalgamation plates. Not all mines in the Nine Mile district are classed as gold producers. The Hauttula is a copper prospect and the Lost Cabin mine contains abundant zinc and lead; both are on Kennedy Creek.

Several of the mines in the district were being developed in 1955—the Nine Mile, and the Francis Copper prospect.

Lolo (Woodman).—Prior to 1922, gold-bearing copper ores were produced from the Lolo district in southwestern Missoula County. The ore deposits which were mined by the Triantler, Sheldon, Lawyers Combination, and Chickaman mines, almost all occur as quartz veins along a shear zone in argillite. There has been little or no activity in this district since 1922.

Nonmetallic Mineral Deposits

Barite.—Principal barite deposits in the County are near Greenough and Coloma.

The Baroid Division of the National Lead Company is (1959) mining barite at the Elk Creek mine in sec. 15, T. 13 N., R. 14 W., on the north fork of Elk Creek about 5 miles southeast of Greenough. About two-thirds of the barite, mined from a 5-to 20-foot vein in argillite, is ground and sold for use in oil well drilling. The remainder is shipped as crude barite for use in sugar refining and in the chemical industry. The Company employs 7 men and the mill capacity is about 8 tons per hour.

The Coloma mine, which is inactive at the present time (1959), also was worked by the National Lead Company. The deposit, in sec. 32, T. 13 N., R. 14 W., about a mile southwest of Coloma, consists of several veins in quartzite. Open-pit mining methods were used during 1956 and underground mining was to start in 1957, but in 1959 the property was reported as inactive.

Barite veins are known to occur just south of the Missoula city limits and on the Whaley group of claims in sec. 28, T. 11 N., R. 19 W. No production is recorded for either property.

Clay.—Pottery and brick clays of good quality have been described from sedimentary beds in Missoula Valley. The clays are associated with Pleistocene lake-bed sediments and individual beds may be

as much as 20 feet thick. In the 1900's a brick plant utilized clays from a site about 5 miles west of Missoula. Clays from near the Buckhouse bridge southwest of Missoula are reported to be ideal for making terra cotta ware, dry-pressed bricks, tile, sewer pipe, and flower pots.

Coal.—Lignite coal has been mined at the Hellgate coal mine 2 miles north of Missoula. The mine was operated intermittently from the 1890's to 1918 and from 1930 to 1944. No production is recorded since World War II. Three coal seams, 7-, 2-, and 4-feet thick, are interbedded with clays and massive tuff in Tertiary lake-bed sediments.

Coal has also been mined at the Thibodeau coal mine on Butler Creek about 6 miles northwest of Missoula. The mine has, however, been inactive for some time.

Pumicite.—Deposits of volcanic ash (pumice) are found in many areas throughout the valley. Early reports describe the pumicite beds as being very pure. Some beds are 35 feet thick. The principal use of pumicite are in abrasives, abrasive soaps, and scouring powders, but production has not been reported.

Stone.—Stone quarries have been operated in the County from time to time. Slate was quarried in the Hellgate Canyon in the 1900's and used for building foundations in Missoula. Earlier reports describe a granite quarry at Wallace and a lime quarry at Frenchtown; neither have been active for many years.

Thin-bedded quartzite and argillite have been quarried for a number of years by the Lyons Construction Company, 2 miles west of Clinton. The Company produces road metal and railroad ballast.

SOIL CONSERVATION DISTRICTS

Missoula County is served by two Soil Conservation Districts. The Mineral County District was organized in 1945 and the Missoula County District in 1947.

That portion of Missoula County west of Huson including the Nine Mile, Six Mile and Petty Creek drainage areas, amounting to 241,562 acres, is included in the Mineral County Soil Conservation District. The remainder of Missoula County, 1,431,758 acres, is included in the Missoula County Soil Conservation District which encompasses the Missoula Valley, the lower part of the Bitterroot Valley, the southern part of the Jocko Valley, the Clinton-Bonita area on the Clark Fork, the lower Blackfoot and Potomac Valleys, the Clearwater drainage and the upper Swan River drainage.

Each District is governed by a board of five supervisors who are elected by the land occupiers of the respective District. They carry out a program in erosion control, water conservation, soil fertility management and proper land use.

Under state law they have the power to call upon local, State and Federal agencies to assist in carrying out a soil and water conservation program. Both of these Districts have memoranda of understanding with the Soil Conservation Service, Office of the Montana State Forester, Indian Service, and the Extension Service to provide the District with technical assistance in carrying out a sound soil and water conservation program.

The Soil Conservation Service assists the District by furnishing and interpreting basic data on soils and plant cover and other features of the land. Technical data are interpreted in terms of acceptable alternative land uses and treatments to help guide the farm and ranch operators in developing sound conservation plans. It also aids District Co-operators in performing operations requiring technical skills beyond the experience of the individuals involved.

The Office of the State Forester and Forest Service co-operate with the District by co-ordinating the programs in timber management, tree planting, forest and range fire control and watershed management on Federal, State and private lands.

The Extension Service assists the District with its education and information program. An important function of each District is to inform landowners and occupiers of the benefits derived from wise use of the communities soil and water resources.

One of the major problems of these Districts is to acquaint the urban people who comprise a large percentage of the total population of the Districts, with the need for conservation.

Technical phases of the District's program include detailed soil surveys, forest site and utilization investigations, range site and condition surveys, ground water investigations, topographic and other engineering surveys. By a careful analysis of this basic resource, information, proper land use, and needed conservation treatment of each field can be determined. The technician interprets the surveys and provides the District Co-operator with alternatives in land use and treatment that will enable him to treat the hazards and limitations that occur on each tract of land. With this information and by counseling with the technician the farmer or rancher makes the final decisions. These decisions are recorded in the Conservation Plan. The Co-operator determines what will be done on his place and when it will be carried out.

When the plan is completed the Co-operator is given further technical assistance on lay out work essential in establishing conservation practices on the land as called for in the Conservation Plan. This technical assistance is provided without cost to the co-operating farmer or rancher.

The total area in Missoula County covered by the two Districts is 1,673,320 acres of which 717,019 are Federal lands. There are approximately 61,000 acres of cropland with over 25,000 acres of cropland irrigated. There are nearly 100,000 acres of range and pasture lands and over 770,000 acres of woodland. That portion of Missoula County within the Mineral District was originally timbered land. Most of the land suitable for cropland has been cleared of timber. To date there are about 7,000 acres that have been cleared and now are used for cropland or pasture.

The chief agricultural enterprise in this area is raising livestock. With nearly one half of the cleared land cultivated, only a small acreage is devoted to raising small grain.

Work done since the organization of the District in 1945 consists primarily of improving irrigation systems, installing sprinkler systems, leveling land, ditch construction and installing water control structures. Five irrigation reservoirs have been constructed to provide late season irrigation water for higher benchlands. Other conservation practices include improved cropping systems, stream bank protection, drainage of wet lands, pasture improvement, grazing land management, timber stand improvement, stream development and stabilization for erosion control, and improvement of wildlife habitat.

On irrigated land the assistance is primarily on proper application of water, sprinkler irrigation systems, water storage, water control structures, land leveling, drainage, soil management, crop rotations and pasture management.

On the established ditch systems, irrigation water supply is about adequate for the land presently irrigated. The systems themselves, however, need improvement, extension and continued maintenance to keep them operating efficiently.

On dry lands and range lands, technical assistance is given on re-seeding methods, proper utilization, deferred grazing and livestock water development. On woodlands most of the assistance is for timber stand improvement and improving harvest methods.

Since the District has been in operation, irrigation water application has been improved on about 17,000 acres of land by installing 113 sprinkler systems to irrigate nearly 6,000 acres, leveling 2,800 acres, establishing border methods of irrigation on 2,500 acres, relocating irrigation ditches and constructing over 800 water control structures. Twenty-six miles of ditches have drained 2,300 acres of wet land. About 3,200 acres of dry land have been seeded to grass for seasonal pastures. These are a few of the practices established.

The Missoula District has working agreements with most of the irrigation companies and irrigation districts in the county. The irrigation companies are provided technical assistance in construction, structure replacement or maintenance of the systems. With assistance from the Missoula District, plans for three group drains have been developed or are now in the process of being developed to drain wet areas of nearly 1,000 acres each in the communities of Grass Valley, Hellgate and Lolo.

It has been the policy of the District to work with groups of co-operators whenever possible to make the most efficient and permanent use of the soil and water resources.

Co-operative efforts of the landowners and operators, other groups and agencies have contributed to the success of the District.

FISH AND GAME

Missoula County is blessed with a number of fine waters for fishing and other water sports. The Montana Fish and Game Department recently began rehabilitation of the Clearwater River Drainage with the construction of a fish barrier—a low dam creating a falls—below Rainy Lake and chemical treatment of the upstream waters to remove nongame fish above the barrier. These waters have been restocked with native cutthroat trout. There are plans for one and possibly two additional barriers downstream. These barriers will permit progressive rehabilitation downstream from the headwaters without danger of rough fish re-invading from below. The smaller management units can be more thoroughly treated with chemicals and managed individually. Lakes and streams of the Clearwater and Upper Swan Drainages are becoming ever more important for recreation due to the excellent access and the scenic area. Other important waters in this county include portions of the Blackfoot, Bitterroot and Clark Fork Rivers. These rivers provide good trout fishing in the summer and whitefish fishing during the winter.

A variety of game animals and birds are found in Missoula County. The foothills and forests are seasonal range of seven big game species. Mule deer, white-tailed deer, elk, moose, mountain goat, black bear and grizzly bear, as well as species of mountain grouse are found in this habitat. The cultivated valleys have ring-necked pheasants, hungarian pheasants and waterfowl species.

The opportunity to hunt is a major attraction to many residents and visitors in the county. In 1958, a total of 23,252 licenses were issued to hunt and fish. Big game hunters obtained 7,863 licenses.

Hunters enjoy outstanding deer and elk hunting in a scenic outdoors. In 1959, three of every four hunters bagged a deer and one third of the elk hunters were successful. Such big game hunting contributes greatly to the recreation of Missoula County.

The future of game resources in the county will depend on habitat conditions. As Missoula County is developed, consideration should be given to the life requirements of game species. If reasonable provisions are made to maintain suitable habitat for game, Missoula County should continue to rank high in recreation from this resource.

LOLO NATIONAL FOREST

The Lolo Forest Reserve was created September 20, 1906, by a proclamation signed by President Theodore Roosevelt. Most of the area included in the reserve was between the Montana-Idaho boundary and the Missoula River, and extended from the Bitterroot River west to the headwaters of the St. Regis River. On November 6, 1906, another proclamation by President Roosevelt enlarged the reserve northward by including a large area between the Missoula River and the Flathead Indian Reservation boundary. Since these early proclamations various other boundary changes and additions have occurred resulting in the present Lolo National Forest, with a gross area of 2,776,373 acres within the proclaimed boundary. Of this gross acreage 2,238,383 acres are national forest land, and 537,990 acres are privately owned land.

The Northern Pacific Railway Company and the Anaconda Company hold most of the private land within the forest boundary. Land grants to the railroad company for developing access to the northwest by railroad resulted in a checkerboard pattern of landownership.

A major objective in managing Lolo National Forest watersheds is the production of streamflow in the amount and quality desired at a time when it is needed. Specifically, this means that timber, forage, and other resources in a drainage basin are managed to control water quality, reduce floods, produce maximum water yield, and time streamflow to meet water needs.

Two problems exist that streamflow regulation through large dams will not solve. One of these is the movement of sediment and its attendant depletion of storage capacity and high maintenance costs. The other is flood protection for the millions of dollars worth of rural and urban developments in upstream sections above the large dams.

The main watershed objectives in these upstream sections are prevention or reduction of surface runoff and erosion in order to provide control of water quality and minimize flood discharges.

Average annual runoff from all lands on the Lolo Forest is about 24 inches. This amounts to six million acre-feet of streamflow, which is about 14 percent of the total streamflow from all lands in

the Region One portion of the Columbia Basin, and nearly one-fourth of the streamflow from all Region One national forest lands in the Columbia drainage. Acre for acre, the average amount of water yield from the Lolo Forest is about four times greater than the average yield from all lands in Region One.

Logging activities on the Lolo Forest have increased greatly during the past fifteen years. The annual cut of timber has increased from 20 million to over 100 million board feet. Under newly proposed timber management plans, a sustained annual cut of well over 100 million feet can be maintained. Sawmilling capacity in communities adjacent to the forest list an annual head-rig capacity of 175 million board feet in Missoula County alone. As more privately owned timber lands are cut over, the local lumber industry is becoming more dependent on the national forest for its log supply.

The Waldorf-Hoerner Paper Products Company operates a recently established pulp mill west of Missoula. Present 200 tons daily capacity will be increased to 500 tons within 2 to 3 years. Plant additions are under construction to provide for the manufacture of certain paper products. Vancouver Plywood Company plans to construct a plant in Missoula by the spring of 1960. In addition, several local firms operate wood products industries adjacent to the Lolo Forest.

The Lolo Forest provides livestock summer range for 150 local ranchers. The forage produced on the forest is an important item in these ranch operations. Grazing permits provide for the grazing of approximately 3,700 cattle and horses for an average season of 3.9 months and 3,500 sheep for an average season of 2.2 months.

Good hunting and fishing can be found throughout the forest. Rock Creek, on the Bonita District, is one of the famous trout fishing streams in the nation. Many mountain lakes provide sport for the fisherman in the back country. Deer and elk are hunted extensively.

Deer hunter success on the forest last year contributed greatly to making Montana the top deer hunting state in the nation. Most of the big game winter ranges were overstocked and during critical winters many animals died of starvation. Fortunately, liberalized hunting regulations in the way of extended seasons, either sex, and two-deer areas have done much to relieve the problem.

Fire control receives top priority on the Lolo Forest during the critical summer months. During the past five years an annual average of 135 fires were suppressed. Extensions of existing transportation systems, improvements in fire fighting methods, and development of new and better equipment have contributed greatly to more effective forest fire control.

Outdoor recreation is big business on the Lolo Forest. Next to wood products it is probably the largest industry in western Montana, and promises to increase in importance rapidly. The prominent place that recreation occupies in multiple use land management is recognized and recreation values are protected and developed to the limit of available financing and facilities. There are 30 existing campgrounds with 150 family units on the forest. Plans have been completed and approved for development of 11 additional campgrounds under the Operation Outdoors program. Visits to all forest areas in 1958 totaled 196,730.

SUMMARY OF IRRIGATED LAND BY RIVER BASINS IN THE
FOLLOWING COUNTIES COMPLETED TO DATE

Big Horn, Broadwater, Carbon, Carter, Custer, Deer Lodge, Fallon, Gallatin, Golden Valley, Granite,
Jefferson, Lewis & Clark, Madison, Meagher, Missoula, Musselshell, Park, Powell, Ra-
valli, Rosebud, Silver Bow, Stillwater, Sweet Grass, Treasure, Wheatland, Wibaux
and Yellowstone

RIVER BASIN	Present Irrigated Acres	Irrigable Acres Under Present Facilities	Maximum Irrigable Acres
Missouri River Drainage Basin			
*Missouri River	71,442.00	16,476.00	87,918.00
Jefferson River	61,291.00	9,713.00	71,004.00
Beaverhead River	40,771.00	6,076.00	46,847.00
Big Hole River	23,775.00	1,950.00	25,725.00
Madison River	39,445.00	7,660.00	47,105.00
Gallatin River	111,914.00	21,097.00	133,011.00
Smith River	30,304.00	18,398.00	48,702.00
Sun River	11,157.00	2,313.00	13,470.00
Musselshell River	64,789.00	57,870.00	122,659.00
Little Missouri River	42,332.00	1,499.00	43,831.00
Grand Total Missouri River Basin	497,220.00	143,052.00	640,272.00
Yellowstone River Drainage Basin			
Yellowstone River	303,501.00	96,148.00	399,649.00
Stillwater River	27,489.00	16,403.00	43,892.00
Clark Fork River	91,768.00	24,195.00	115,963.00
Big Horn River	65,395.00	25,579.00	90,974.00
Tongue River	22,137.00	7,479.00	29,616.00
Powder River	8,795.00	1,814.00	10,609.00
Grand Total Yellowstone River Basin	519,085.00	171,618.00	690,703.00
Columbia River Drainage Basin			
Clark Fork (Deer Lodge, Hellgate, Mis- soula) River	145,804.70	14,934.20	160,738.90
Bitterroot River	111,102.43	3,200.00	114,302.43
Grand Total Columbia River Basin	256,907.13	18,134.20	275,041.33
Grand Total in the Counties Completed to Date	1,273,212.13	332,804.20	1,606,016.33

*Names of streams indented on the left-hand margin indicate that they are tributaries of the first stream named above which is not indented.

IRRIGATION SUMMARY OF MISSOULA COUNTY BY RIVER BASINS

COLUMBIA RIVER BASIN	Present Irrigated Acres	Irrigable Acres Under Present Facilities	Maximum Irrigable Acres
*Clark Fork (Hellgate, Missoula) River...	11,891.35	1,326.50	13,217.85
Springs	201.00	0	201.00
Cramer Creek	227.00	0	227.00
Rock Creek	320.00	35.00	355.00
Gilbert Creek	45.00	0	45.00
South Fork Gilbert Creek	15.00	0	15.00
Birch (Swartz) Creek	59.00	0	59.00
Sump	15.00	0	15.00
Unnamed Creek	18.00	0	18.00
Wallace (Woodville, Camas Trail) Creek	88.00	0	88.00
Johnson Creek	18.00	0	18.00
Northey (Trail, Hoverson) Creek	8.00	0	8.00
Slough	95.00	0	95.00
Smith Creek	30.00	0	30.00
Allen Creek	0	35.00	35.00
Dirty Ike (Donovan) Creek	60.00	0	60.00
Blue Grass Gulch (Kendall Creek)	35.00	0	35.00
Crystal Creek	12.00	0	12.00
Turah Creek	35.00	0	35.00
Unnamed Creek	6.00	0	6.00
Well	10.00	0	10.00
Springs	21.00	0	21.00
Deer Creek	3.00	0	3.00
(Big) Blackfoot River	15.00	74.00	89.00
Cottonwood (West Fork Shanley) Creek	187.00	0	187.00
Sharp Creek	0	94.00	94.00
Clearwater River	179.00	78.00	257.00
Camp (Inez) Creek	77.00	0	77.00
Deer Creek	108.00	0	108.00
Gretchen's Pond	17.00	0	17.00
Morrell (East Fork Clearwater River) Creek	197.00	0	197.00
Trail Creek	98.00	36.00	134.00
Owl Creek	0	0	0
Placid Creek	0	0	0
Owl (Boles) Creek	7.00	0	7.00
Blanchard Creek	53.00	28.00	81.00
West Fork Blanchard Creek	71.00	0	71.00

*Names of streams indented on the left-hand margin indicate that they are tributaries of the first stream named above which is not indented.

IRRIGATION SUMMARY OF MISSOULA COUNTY BY RIVER BASINS

COLUMBIA RIVER BASIN—(Continued)	Present Irrigated Acres	Irrigable Acres Under Present Facilities	Maximum Irrigable Acres
Big Fish Creek.....	48.00	0	48.00
Little Fish Creek.....	71.00	0	71.00
Elk Creek.....	772.00	0	772.00
Unnamed Stream.....	25.00	0	25.00
Black Canyon Creek.....	25.00	0	25.00
Belmont Creek.....	25.00	0	25.00
Gold Creek.....	47.00	22.00	69.00
West Fork Gold Creek.....	43.00	0	43.00
Burnt Bridge Creek.....	15.00	0	15.00
Warm Spring Creek.....	14.00	0	14.00
Union Creek.....	1,495.00	27.00	1,522.00
Waste.....	7.00	0	7.00
Washoe Creek.....	14.00	0	14.00
Unnamed Creek.....	12.00	0	12.00
Camas Creek.....	480.00	120.00	600.00
Ashby (Ashley) Creek.....	290.00	0	290.00
Arkansas Creek.....	154.00	0	154.00
Spring.....	17.00	0	17.00
Blixit Creek.....	76.00	0	76.00
Nelson (Game) Creek.....	223.00	0	223.00
Norman Creek.....	5.00	0	5.00
Unnamed Creek.....	16.00	0	16.00
Bear (Spring Brook) Creek.....	128.00	16.00	144.00
East Twin Creek.....	2.00	0	2.00
West Twin Creek.....	3.00	0	3.00
Falls Creek.....	7.00	0	7.00
Demmons (St. Lawrence) Creek.....	22.00	0	22.00
Bear Creek.....	9.00	0	9.00
Johnson Creek.....	0	11.00	11.00
Total (Big) Blackfoot River and Its Tributaries	5,054.00	506.00	5,560.00
Higgins Creek.....	8.00	5.00	13.00
Marshall Creek.....	33.00	5.00	38.00
Rattlesnake Creek.....	281.00	306.00	587.00
Lakes.....	4.00	12.00	16.00
Coal Pit Creek in Wood's Gulch.....	9.00	0	9.00
Well.....	61.00	0	61.00
Grant Creek.....	2,037.00	259.00	2,296.00
Deep Well.....	10.00	8.00	18.00
Unnamed Stream.....	86.00	0	86.00
Bitterroot River.....	1,213.00	0	1,213.00

IRRIGATION SUMMARY OF MISSOULA COUNTY BY RIVER BASINS

COLUMBIA RIVER BASIN—(Continued)	Present Irrigated Acres	Irrigable Acres Under Present Facilities	Maximum Irrigable Acres
One Horse (Squaw) Creek.....	35.00.....	0.....	35.00
Carlton Creek	1,337.00.....	0.....	1,337.00
Waste	75.00.....	0.....	75.00
McLain Creek	80.00.....	0.....	80.00
Well	12.00.....	0.....	12.00
Lolo Creek	1,989.00.....	105.00.....	2,094.00
Graves Creek	0.....	12.00.....	12.00
East Fork Graves Creek	0.....	37.00.....	37.00
Bear Creek	0.....	3.00.....	3.00
Woodman Creek	12.00.....	0.....	12.00
South Fork Lolo Creek.....	218.00.....	20.00.....	238.00
Mill Creek	190.00.....	0.....	190.00
Westerman Gulch	12.00.....	0.....	12.00
Johnny Creek	8.00.....	0.....	8.00
Mormon Creek	385.00.....	70.00.....	455.00
John Mills Slough	12.00.....	0.....	12.00
Slough	95.00.....	0.....	95.00
Spring	50.00.....	0.....	50.00
Miller Creek	545.00.....	154.00.....	699.00
Park Creek	70.00.....	0.....	70.00
Bear Run	8.00.....	0.....	8.00
Dagert Creek	3.00.....	0.....	3.00
Buckhouse (Hayes) Creek	15.00.....	0.....	15.00
Waste	24.00.....	0.....	24.00
O'Brien Creek	145.00.....	0.....	145.00
Total Bitterroot River and Tributaries	6,533.00.....	401.00.....	6,934.00
Sloughs	182.00.....	0.....	182.00
Butler Creek	129.00.....	0.....	129.00
Dusseault Creek	73.00.....	0.....	73.00
Jette Drain	11.00.....	57.00.....	68.00
Sol's Slough	3.00.....	0.....	3.00
Slough	89.00.....	0.....	89.00
Deep Creek	0.....	0.....	0
West Fork Deep Creek	50.00.....	0.....	50.00
Cald Eell Creek	212.00.....	0.....	212.00
Slough	60.00.....	0.....	60.00
LaValle Creek	250.00.....	0.....	250.00
O'Keefe Creek	188.00.....	120.00.....	308.00
Albert Creek	0.....	165.00.....	165.00
Mill Creek	85.00.....	0.....	85.00

IRRIGATION SUMMARY OF MISSOULA COUNTY BY RIVER BASINS

COLUMBIA RIVER BASIN—(Continued)	Present Irrigated Acres	Irrigable Acres Under Present Facilities	Maximum Irrigable Acres
Turmell Pond & Spring	100.00	30.00	130.00
Gravel Pit	28.00	0	28.00
Six Mile Creek	442.00	78.00	520.00
Unnamed Stream	13.00	0	13.00
Isaac (West Fork Six Mile) Creek	218.00	0	218.00
Waste	57.00	0	57.00
Tank Creek	55.00	100.00	155.00
Tommie Creek	42.00	0	42.00
Unnamed Stream	30.00	0	30.00
Nine Mile Creek	1,138.00	5.00	1,143.00
Unnamed Stream	2.00	0	2.00
Burnt Fork Creek	0	5.00	5.00
Soldier Creek	0	6.00	6.00
Pine Creek	20.00	0	20.00
Marion Creek	35.00	0	35.00
Moncure (Shady) Creek	8.00	0	8.00
Petty (Josephine) Creek	15.00	4.00	19.00
Raspberry Creek	30.00	0	30.00
McCormick Creek	31.00	0	31.00
Harris (Fire) Creek	55.00	30.00	85.00
Kennedy Creek	40.00	0	40.00
Cedar Creek	16.00	0	16.00
Spring & Seepage	32.00	0	32.00
Free Creek	1.00	0	1.00
Butter (Butler) Creek	48.00	0	48.00
Stony (Rock, Ballard, Four Mile) Creek	648.00	582.00	1,230.00
Goose Creek	0	13.00	13.00
Rennick (Niece) Creek	17.00	7.00	24.00
Deer Creek	31.00	0	31.00
Rock Creek	0	0	0
Blanchard Gulch	0	25.00	25.00
Total Nine Mile Creek and Tributaries	2,167.00	677.00	2,844.00
Petty Creek	98.00	13.00	111.00
East Fork Petty Creek	8.00	0	8.00
South Fork Petty Creek	4.00	0	4.00
Mike's Creek	10.00	0	10.00
Bill's Creek	9.00	0	9.00
Garden Creek	4.00	0	4.00
John's Creek	5.00	6.00	11.00

IRRIGATION SUMMARY OF MISSOULA COUNTY BY RIVER BASINS

COLUMBIA RIVER BASIN—(Continued)	Present Irrigated Acres	Irrigable Acres Under Present Facilities	Maximum Irrigable Acres
Gus Creek	10.00	0	10.00
Ed's Creek	69.00	0	69.00
Unnamed Stream	3.00	0	3.00
Monahan Spring	13.00	0	13.00
Flathead River	0	0	0
Swan River	0	0	0
Bob Creek	0	90.00	90.00
Holland Creek	110.00	0	110.00
Spring Creek	61.00	0	61.00
Barber Creek	5.00	0	5.00
Cooney Creek	24.00	0	24.00
Glacier Creek	20.00	0	20.00
Unnamed Creek	16.00	0	16.00
Jocko River	1,783.48	108.20	1,891.68
Stevens Creek	5.00	0	5.00
Agency Creek	80.00	63.00	143.00
Big Knife Creek	0	0	0
McClure Creek	43.00	0	43.00
Finley Creek	363.00	0	363.00
Branch of Finley Creek	37.00	0	37.00
East Finley Creek	228.87	101.50	330.37
Waste	26.00	0	26.00
Total Irrigation in Missoula County	34,847.70	4,507.20	39,354.90

BIG FLAT IRRIGATION DISTRICT

HISTORY

The establishment of the Big Flat Irrigation District was completed under the laws of the State of Montana by a District Court decree on July 20, 1944.

A contract between the Big Flat Irrigation District and the United States (Department of the Interior) was entered into on April 2, 1945, whereby the United States would furnish the financial assistance for construction of the irrigation project. A loan of \$45,000 was made to the District by the United States, and under terms of the contract the United States would have jurisdiction in the development and operation of the project during the period of repayment of the loan. The construction obligation charge provided for payments from the District to the United States in semiannual installments as follows: The first 8 semiannual installments each shall be in the amount of \$211.00; the next 4 semiannual installments, \$281.25 each; the next 4 semiannual installments, \$422.00 each; the next 8 semiannual installments, \$562.50 each; the next 32 semiannual installments, \$703.00 each; the next 23 semiannual installments, \$562.50 each; and the last semiannual installment shall be in the amount of \$565.50. The first semiannual installment shall be due and payable December 31 of the calendar year following the close of the development period, and the second shall be due and payable on June 30 of each year of the repayment period, until the full amount of the construction charge obligation shall have been repaid to the United States.

The project works to be constructed by the United States include a diversion with control works on the Bitterroot River just south of the highway bridge on U. S. Highway No. 93 in the vicinity of the city of Missoula, and a gravity canal for the diversion and carrying of water from the headworks for a distance of about six miles to the project area on the west side of the Clark Fork River, near its confluence with the Bitterroot River. Other features included in the construction were described as a conduit near the end of the canal, a syphon, the usual turnouts, wasteways, laterals, small bridges, and if required, drainage facilities. All of the works herein described, together with the lands, rights-of-way and the water right were considered as a part of the project works.

PRESENT STATISTICS

Location: Following a northwesterly direction, the Big Flat Irrigation ditch diverts from the left bank of the Bitterroot River in the SW $\frac{1}{4}$ SE $\frac{1}{4}$ of sec. 2, T. 12 N., R. 20 W. The irrigation of land served by the ditch system is located in secs. 6, 7, 8, 16, 17, 18, 20, and 21, T. 13 N., R. 20 W.; and secs. 1 and 2, in T. 13 N., R. 21 W.

Length and Capacity of Canal: The main ditch has an over-all length of 9 miles and an initial carrying capacity of about 25 second-feet.

Operation and Maintenance: The District's assessments for operation and maintenance will vary from year to year. For example, in 1950 the assessment was \$4.00 per acre while in 1958 the assessment was \$1.25 per acre. A stipulation under the contract states, "that no water shall be delivered to or for any tract of land in the District while there are unpaid operation and maintenance assessments."

Present Users: There are at the present date (1959), 9 landowners participating in the District. The amount of water required under this project is one miner's inch for each acre irrigated.

Acreage Irrigated: In 1959, under the Big Flat Irrigation District there were 998 acres irrigated and no potential irrigable acreage.

WATER RIGHT DATA

The water right for the District lands is based on the appropriation made on the 4th day of December, 1944, by the State Water Conservation Board for 50 cfs of all the unappropriated waters of the Bitterroot River and its tributaries in Missoula and Ravalli Counties. (Ref. Book J of Water Rights, Page 421, Clerk and Recorder's Office, Missoula, Montana). (See Maps in Part II, Pages 17 and 18).

CARLTON CREEK IRRIGATION COMPANY

HISTORY

"The purposes for which the Carlton Creek Irrigation Company were formed are to divert, appropriate, buy, sell, lease, and use the waters of Carlton Creek, Carlton Creek Lakes and their tributaries; to acquire and own, water rights and easements in the waters of Carlton Creek, Carlton Creek Lakes and their tributaries; and to acquire, buy, appropriate, and own, lease, sell any and all ditch right-of-ways, easements, dams, flumes, land, reservoirs, reservoir sites, etc., necessary or convenient to be owned, appropriated or used in and about the appropriation, buying, selling, leasing or using said waters."

This Company was first incorporated on September 20, 1898, for a term of existence of twenty years. A renewal of the term of corporate existence was made on November 30, 1918, and their last corporation papers filed on June 15, 1939.

Capital stock in the Company totals \$1,600, which was divided into sixty-four shares of a par value of \$25 per share. All the shares of stock are subscribed to and active in the Company.

PRESENT STATISTICS

Location: The water stored in the Carlton Creek Lakes No's. 1 & 2 is issued to supplement the irrigation of lands in secs. 14, 15, 22, 23, 26 and 27, T. 11 N., R. 20 W. At the present time only Carlton Creek Lake No. 1 is used as a storage reservoir, the dam at Lake No. 2 being in poor repair. The lakes are located at the headwaters of Carlton Creek in sec. 27, T. 11 N., R. 21 W.

Capacity of Reservoir: Carlton Creek Lake No. 1 has a storage capacity of 450 acre-feet.

Operation and Maintenance: Charges assessed members for operation and maintenance are negligible and will vary each year, the amount depending on repairs required in the upkeep of facilities at the storage dam. Each water user maintains his own private ditch to divert the stored water from Carlton Creek onto his land.

Present Users: There is a total of thirteen water users owning all 64 shares of stock in the Company, twelve are delivered water for their lands in Missoula County, with one stockholder being supplied in Ravalli County.

Acreage Irrigated: In 1959, supplemental water was furnished from storage to 854 acres in Missoula County and 20 acres in Ravalli County.

WATER RIGHT DATA

Both of the Carlton Creek Lakes No's. 1 & 2 are located on U. S. Forest Service land and are operated by the Company for storage purposes under a special use permit. No recorded water right filing was made by the Carlton Creek Irrigation Company for storage in the lakes except by the use permit issued by the Forest Service.

(See Maps in Part II, Pages 4 and 7).

CLINTON IRRIGATION DISTRICT

HISTORY

The Clinton Irrigation District was created by a district court decree on September 17, 1919 (Case No. 7522). Among the first water users under the project were the Clinton Townsite Company, John Peers, Myrtle V. Wanick, Franklin Hollensteiner, R. A. Blazer, R. S. Thompson, M. H. Coultas, G. F. Turman, R. W. Angerwine, Edward Hoverson, William W. Carr, W. E. Koch, Thomas E. Lewis, Mary Ailport, and the Western Montana Land Company.

The purpose in establishing the Clinton Irrigation District was to construct the necessary works, canals, etc., and acquire water rights and other properties for the irrigation of lands within the District.

The District is divided into 3 divisions, the boundaries which are defined as follows: (1) All the lands on said District lying from the point of diversion of said District to that section line between sec. 22 and 26, running East and West in T. 12 N., R. 17 W., shall be included in and be known as Division Number One. (2) All lands of said District lying between the section line between secs. 22 and 26, which line runs East and West to the center line running North and South through secs. 16 and 21, T. 12 N., R. 17 W., shall be included in and be known as Division Number Two. (3) All lands in said District lying between the center line running North and South through secs. 16 and 21, T. 12 N., R. 17 W., to and including the land of R. A. Blazer in sec. 18, T. 12 N., R. 17 W., shall be in and known as Division Number Three.

PRESENT STATISTICS

Location: The original point of diversion of the District's main canal was from the right bank of the Clark Fork River in the SE $\frac{1}{4}$ NE $\frac{1}{4}$ of sec. 11, T. 11 N., R. 17 W. By an agreement with Donald Roth, the District now uses the headgate and part of the Roth Ditch, which is located in the SW $\frac{1}{4}$ NW $\frac{1}{4}$ of sec. 12, T. 11 N., R. 17 W. Lands irrigated under this project are in sec. 2, T. 11 N., R. 17 W., and secs. 16, 17, 21, 22, 23, 26, 27, and 35, T. 12 N., R. 17 W.

Length and Capacity of Canal: The District canal has an initial capacity of 75 second-feet and a total length of 7 miles.

Operation and Maintenance: The original construction costs of this project have been paid and the District is free of any indebtedness. A levy is now assessed to each member which may vary from 25c to \$1.00 per acre, per year, depending on any new construction or maintenance necessary.

Present Users: There were 8 District members receiving water for the irrigation of their land in 1959.

Acreage Irrigated: The District had a total of 775 acres irrigated during the year of 1959, with no potentially irrigable acres under the ditch system.

WATER RIGHT DATA

The Clinton Irrigation District made a water right filing for 2,500 miner's inches of water from the Clark Fork (Hellgate) River on October 28, 1919. (Ref. Book J of Water Rights, Page 153, Missoula County Courthouse).
(See Map in Part II, Page 2).

FLATHEAD PROJECT (Jocko Division)

HISTORY

Shortly after the Mission was founded at St. Ignatius in 1854, water was taken from Mission Creek by the Jesuit Priests for irrigation of lands along the creek. This was the first irrigation of record on the reservation, although prior to the authorization of the irrigation project, a few Indians and whites on behalf of the Indians, had constructed ditches from many of the principal streams. These irrigated areas were small, and irrigation by hit and miss flooding methods was practiced with a remarkable degree of carelessness.

In 1904, Congress authorized a preliminary survey to determine whether or not an irrigation project was feasible, and in 1907 an arrangement was made between the office of Indian Affairs and the Reclamation Service whereby the latter would furnish the engineering organization to make the surveys and carry on the construction work. Construction began in 1909 and has been carried on continuously since that date. Until April, 1924, the engineering work was done by the Reclamation Service and submitted to the Commissioner of Indian Affairs for approval. Since then all of the work on the project has been under the Bureau of Indian Affairs.

The project area and divisions of the Flathead Irrigation Project embraces a gross area of approximately 300,000 acres. This area is geographically separated into three divisions containing 138,000 acres of irrigable land, in addition to about 7,000 acres covered by private water rights.

The water users on the Flathead Project are organized into three irrigation districts; the Flathead Irrigation District, the Mission Irrigation District, and the Jocko Valley Irrigation District. These districts were organized under Montana law and their creation was affirmed by court decree on August 26, 1926.

The water supply of the Flathead Project comes from a large number of streams by gravity flow, with a supplemental supply to be obtained from the Flathead River by pumping. The supplies for the three divisions of the project are largely independent of each other.

The Jocko Division that extends into Missoula County is in the Jocko River Valley on the south side of the Flathead Project. There is, however, about 700 acres of land geographically separate near the town of Dixon included in this division. The water supply for this area is obtained from the Jocko River and tributaries. Most of the irrigable lands lie along the main line of the Northern Pacific Railway.

The Jocko Lake Reservoir is the only storage available for the Jocko Division. A storage capacity of 7,000 acre-feet has been developed at this site by building a concrete lined tunnel through the natural dam at the foot of the lake, and blanketing the upstream slope of the dam with selected material. The natural flow to this reservoir is supplemented by flood waters of the North Fork of Placid Creek, through the Placid Creek Canal. This canal is 2½ miles in length, and has a capacity of 125 second feet. Water from the Jocko Lake Reservoir is turned into the Middle Fork of the Jocko River, and flows down the river for several miles before being diverted into the lateral systems of the Jocko Division.

The Flathead Project has justly become famous for its beautiful mountains, lakes and forests, fertile lands, excellent hay, grains, field seed production, and stock raising, particularly dairy herds.

PRESENT STATISTICS

Location: Lands irrigated in Missoula County under the Jocko Division of the Flathead Project are located in secs. 19, 20, 21, 22, 28, 29, 30, 31, and 32, T. 16 N., R. 19 W.; secs. 23 and 24, T. 16 N., R. 20 W.

Length and Capacity of Canals: The canals in the system serving the Jocko Division in the county are designated as "E," "J," "N," and "S." Canal "E" has a length of 4¼ miles where it enters Missoula County with its point of diversion from the Jocko River in Lake County. Canal "J" is 2½ miles in length and diverts from Agency Creek and carries a large supply of water from the Jocko River. Canal "N" has its point of diversion from East Finley Creek and is about 2 miles in length. Canal "S" has its point of diversion from the Jocko River in Lake County and, where it enters Missoula County, is approximately 4 miles in length. Capacities of the canals E, J, N, and S are 45, 35, 15, and 45 cfs respectively.

Size and Capacity of Reservoir: The Jocko Lake Reservoir is the only storage available for the Jocko Division and has a capacity of 7,000 acre-feet.

Operation and Maintenance: The Flathead Project is operated and maintained entirely by the United States Indian Irrigation Service. The districts have not yet contracted to take over any part of the operation and maintenance. The O. & M. assessment charges per acre in the Jocko Division vary from year to year. For the year 1960 the assessment was \$2.88 per acre.

Present Users: The number of active users buying water from the project totals 27.

Acreage Irrigated: In the year of 1959, there were 1,959.08 acres irrigated under the Jocko Division in Missoula County with 262.70 acres potentially irrigable under the present project ditch system.

WATER RIGHT DATA

Water rights that apply to the Jocko Division of the Flathead Project in Missoula County were filed by the United States of America and are as follows:

Agency Creek An appropriation dated 1-22-10 for 4,000 miner's inches (Ref. Book D of Water Rights, Page 548, Missoula County), an appropriation dated 4-2-10 for 4,000 miner's inches (Ref. Book D of Water Rights, Page 556, Missoula County), an appropriation dated 10-9-13 for 4,000 miner's inches (Ref. Book J of Water Rights, Page 64, Missoula County), an appropriation dated 10-10-13 for 4,000 miner's inches (Ref. Book J of Water Rights, Page 67, Missoula County).

Big Knife Creek An appropriation dated 8-1-10 for 4,000 miner's inches (Ref. Book J of Water Rights, Page 56, Missoula County).

Finley Creek An appropriation dated 10-9-13 for 4,000 miner's inches (Ref. Book J of Water Rights, Page 69, Missoula County).

East Finley Creek An appropriation dated 10-9-13 for 20,000 miner's inches (Ref. Book J of Water Rights, Page 59, Missoula County).

Unnamed Creek (Trib. to Finley Creek) An appropriation dated 10-9-13 for 2,000 miner's inches (Ref. Book J of Water Rights, Page 61, Missoula County), an appropriation dated 10-9-13 for 2,000 miner's inches (Ref. Book J of Water Rights, Page 62, Missoula County), an appropriation dated 10-9-13 for 4,000 miner's inches (Ref. Book J of Water Rights, Page 70, Missoula County).

Jocko River An appropriation dated 1-22-10 for 200,000 miner's inches (Ref. Book A of Water Rights, Page 34, Lake County), an appropriation dated 4-2-10 for 200,000 miner's inches (Ref. Book A of Water Rights, Page 55, Lake County), an appropriation dated 4-19-10 for 200,000 miner's inches (Ref. Book A of Water Rights, Page 284, Lake County).
(See Map in Part II, Page 34).

FRENCHTOWN IRRIGATION DISTRICT

HISTORY

The matter of establishing the Frenchtown Irrigation District was consummated by district court decree on November 19, 1934. Under provisions of the decree the District agreed to co-operate with the United States under Federal Reclamation Laws for the purpose of constructing irrigation works, and for the purchase, extension, operation and maintenance of the constructed works.

A repayment contract was entered into between the Frenchtown Irrigation District and the United States of America whereby the District would assume the indebtedness to the United States on account of the District lands.

PRESENT STATISTICS

Location: The Frenchtown Irrigation District main canal diverts from the right bank of the Clark Fork River in the SE¼SE¼ of sec. 8, T. 13 N., R. 20 W. Following a northwesterly direction, the canal supplies water for the irrigation of land in sec. 6 in T. 13 N., R. 20 W.; secs. 30 & 31, in T. 14 N., R. 20 W.; secs. 1, 2, 11, 12, 13, 14, 23, 24, 25, & 36, in T. 14 N., R. 21 W.; secs. 19, 27, 28, 29, 30, 31, 33, 34, & 35, in T. 15 N., R. 21 W.; secs. 25 & 26, in T. 15 N., R. 22 W.

Length and Capacity of Canal: The overall length of the District canal is about 16 miles and has an initial carrying capacity of 85 cfs.

Operation and Maintenance: Repayment of the United States loan is based on a total charge of \$2.65 per acre, per year, of which \$1.25 is collected for operation and maintenance and the balance of \$1.40 used for payment on the loan principal.

Present Users: There are 50 members included in the District.

Acreage Irrigated: The acreage irrigated in 1959 under the District totals 2,968.60 acres with 946 acres potentially irrigable under present ditch facilities.

WATER RIGHT DATA

Edward Donlan, one of the early promoters in the organization of the Irrigation District, made the water right filing that is used and applies to the project. The water right is as follows: Appropriated by Edward Donlan from the Clark Fork River (Hellgate River) 8,000 miner's inches, dated September 14, 1933. (Ref. Book J of Water Rights, Page 315, Missoula County Courthouse). (See Maps in Part II, Pages 17, 25, 26, 30 and 31).

GRASS VALLEY FRENCH DITCH COMPANY

HISTORY

The date of the first incorporation of the Grass Valley French Ditch Company was on November 20, 1901. After operating for a period of 20 years, the Company was dissolved on November 22, 1921.

On March 6, 1925, a new corporation was formed to replace the first corporation, and it acquired by purchase all the properties of the former ditch company. The new corporation also assumed all of the debts, liabilities and obligations of the first corporation. Capital stock subscribed to in the second corporation totaled \$21,150, represented by 4,230 shares at a par value of \$5.00 per share. Names of the directors who managed the business affairs of the second corporation for the first 3 months were: Ulric W. Deschamps, Julius Stieger, P. Loiselle, R. Deschamps, and Henry F. Cyr. The term for which the corporation shall exist is 40 years.

PRESENT STATISTICS

Location: The Grass Valley French Ditch diverts from the right bank of the Clark Fork (Hellgate) River in the NE¼SE¼ of sec. 22, T. 13 N., R. 20 W. From its point of diversion, the ditch

follows a northwesterly direction to supply water for the irrigation of lands in secs. 3, 4, 5, 8, 9, 10, 16, 21, and 22, in T. 13 N., R. 20 W.; secs. 18, 19, 29, 30, 32, 33, and 34, in T. 14 N., R. 20 W.; and secs. 12, 13, 24, and 25, in T. 14 N., R. 21 W.

Length and Capacity of Canal: The length of the Grass Valley French Ditch is 13.5 miles and has an initial capacity of about 100 second-feet.

Operation and Maintenance: Yearly assessments for operation and maintenance will vary between \$1.00 and \$1.25 per share. Each share of stock in the Company represents one miner's inch of water.

Present Users: Under this Ditch Company, there are 21 water users that own the 4,230 active stock shares.

Acreage Irrigated: In 1959, there were 3,055 acres irrigated with 45 acres potentially irrigable, making a maximum total irrigable acreage of 3,100 acres.

WATER RIGHT DATA

Two water rights were filed and recorded by the Grass Valley French Ditch Company for irrigation of land under the ditch system. These filings are as follows: From the Hellgate River 10,000 miner's inches dated November 25, 1901. (Ref. Book D of Water Rights, Page 331, Missoula County Courthouse); from a slough of the Hellgate River 10,000 miner's inches dated November 25, 1901. (Ref. Book D of Water Rights, Page 333, Missoula County Courthouse). (See Maps in Part II, Pages 17, 25, 26).

HELLGATE VALLEY IRRIGATION COMPANY (Flynn-Lowney Ditch)

HISTORY

On October 9, 1919, the private ditch known as the "Flynn-Lowney Ditch," incorporated for a period of 40 years under the name of the Hellgate Valley Irrigation Company. The original Flynn-Lowney Ditch was first constructed by Michael Flynn and C. C. Lowney in the year 1903 for the irrigation of their ranch lands.

The corporation articles list the capital stock of this company at \$37,500 which is divided into 2,500 shares of a par value of \$15 per share. Shares of stock actually subscribed to in the company are 1,750, valued at \$26,250.

When the Hellgate Valley Irrigation Company was organized, 600 shares were given to the heirs of Michael Flynn and 600 shares to the successors in interest of C. C. Lowney. This amount representing 1,200 miner's inches (1 share equals 1 miner's inch) is a priority right on the first 1,200 miner's inches of water flowing in the ditch system.

By an agreement with the corporation, the American Crystal Sugar Company may use the full capacity of the Hellgate Valley Irrigation Company ditch for irrigating and for their sugar beet process-

ing plant. For this privilege, the Sugar Company agreed to pay one third of the operation and maintenance charges and one third of the total costs of any new construction connected with the ditch east of their factory.

The stock of the corporation is assessable for the purpose of raising funds for the construction of dams, headgates, reservoirs, ditches, flumes, and maintenance of the same, and for the purchase of rights-of-way if necessary.

PRESENT STATISTICS

Location: From its point of diversion on the right bank of the Clark Fork River in the NW¼-NE¼ of sec. 21, T. 13 N., R. 19 W. the main canal of the Hellgate Valley Irrigation Company follows a generally westerly direction for the irrigation of lands in secs. 18 and 19, T. 13 N., R. 19 W.; and secs. 11, 12, 13, and 14, T. 13 N., R. 20 W.

Length and Capacity of Canal: The initial capacity of the canal is in excess of 50 cfs and has a length of 4.5 miles.

Present Users: Active stock shares in this Company total 1,750 which are owned in various amounts by 15 water users. One share of stock represents one miner's inch of water.

Acres Irrigated: In 1959, there were 1,339 acres irrigated under this Company's ditch system with no potential irrigable acres.

WATER RIGHT DATA

Water right filings which are applicable to the Hellgate Valley Irrigation Company are as follows: From the Clark Fork (Hellgate) River an appropriation made by Michael, John J., and Michael Jr. Flynn, as of the date of December 1, 1902 for 1,600 miner's inches. (Ref. Book D of Water Right Records, Page 612); an appropriation made by the Hellgate Valley Irrigation Company as of the date November 17, 1919 for 2,500 miner's inches. (Ref. Book J of Water Right Records, Page 124); an appropriation made by John A. Shaughnessy as of the date July 28, 1919 for 2,500 miner's inches. (Ref. Book I of Water Right Records, Page 362); an appropriation made by Con Lowney as of the date May, 1903 for 10,000 miner's inches. (Ref. Book I of Water Right Records, Page 147). The American Crystal Sugar Company have their own water right filings that they use in the Hellgate Valley Irrigation Company ditch. These 2 filings were made under the name of the Amalgamated Sugar Company and are as follows: From the Clark Fork (Missoula) River an appropriation dated December 3, 1917 for 280 miner's inches. (Ref. Book J of Water Right Records, Page 269); an appropriation dated December 3, 1917 for 280 miner's inches. (Ref. Book J of Water Right Records, Page 274).

All of the above water right filings are recorded in the Clerk and Recorder's Office, Missoula County Courthouse.

(See Maps in Part II, Pages 16 and 17).

MISSOULA IRRIGATION DISTRICT

HISTORY

W. J. McCormick, in the year 1880 constructed the original ditch now used by the Missoula Irrigation District. The Missoula Irrigation District Canal still uses the same point of diversion as the old McCormick Ditch, but the ditch has been enlarged and the system extended to include many more water users under the ditch system.

In May 1883, control and ownership of the McCormick Ditch was transferred to Owen Kelley, Joseph S. Booth, and Ed. Miller. A filing was made by all three men for 5,000 miner's inches of water from the Hellgate River, although the ditch name included only Miller and Kelley.

Samuel Dinsmore, became by land purchase another water user under the Miller-Kelley Ditch and he made two filings from the Hellgate River for $333\frac{1}{4}$ and 2,000 miner's inches in June, 1882 and September 4, 1901 respectively.

Sometime prior to 1901, and during the process of enlarging and extending Miller-Kelley Ditch, another lateral ditch called the Cave-Gannon became connected with the irrigation system. Until 1922 the irrigation project was known as Miller-Kelley-Cave-Gannon Consolidated Irrigation Ditch.

On October 14, 1922, the owners of the lands served by the Miller-Kelley-Cave-Gannon Ditch, formed by court decree the Missoula Irrigation District, for the purpose of maintenance, and complete operation of the irrigation project.

One important stipulation listed in the decree creating the District was that the water rights of the landowners under the Miller-Kelley-Cave-Gannon Consolidated Ditch as determined by the court on June 14, 1905, (Case No. 2500), would not be disturbed by the establishment of the Missoula Irrigation District.

PRESENT STATISTICS

Location: The Missoula Irrigation District Canal diverts from the left bank of the Clark Fork River (sometimes called Hellgate and Missoula River) in the SE $\frac{1}{4}$ of sec. 22, T. 13 N., R. 19 W.

The location of the irrigated land areas within the District are in secs. 19, 20, 29, 30 & 32, T. 13 N., R. 19 W.; secs. 23, 24, 25, 26, 34, & 35, T. 13 N., R. 20 W.; sec. 1, T. 12 N., R. 20 W.; and sec. 6, T. 12 N., R. 19 W. A considerable amount of the irrigated acreage is small tracts of land which are located in subdivisions of the city of Missoula.

Length and Capacity of Canal: Estimated initial carrying capacity of the District's main canal is about 100 second-feet, having a width of 10 feet by 4 feet in depth. There are several miles of lateral ditches connected to the main canal, which is approximately 6 miles in length.

Operation and Maintenance: Total water charges for this irrigation project including operation and maintenance are \$3.75 per miner's inch per year.

Present Users: Records of the District's secretary show a total of 624 active water users.

Acreage Irrigated: The acreage irrigated under the District in 1959 is 2,241.50 acres, with 50 acres potentially irrigable.

WATER RIGHT DATA

The Missoula Irrigation District has the following appropriations that apply to the Clark Fork River (also known as the Hellgate, and Missoula River): (1) Appropriated by Ed. Miller, Joseph S. Booth, and Owen Kelley, dated May 1883, for 5,000 miner's inches from the Hellgate or Missoula River. (Ref. Book C of Water Rights, Page 75). (2) Appropriated by Samuel Dinsmore, dated June 1, 1882, for 333 $\frac{1}{3}$ miner's inches from the Hellgate River. (Ref. Book E of Water Rights, Page 478). (3) Appropriated by Samuel Dinsmore, dated September 4, 1901, for 2,000 miner's inches from the Hellgate River. (Ref. Book D of Water Rights, Page 321). Above appropriations are located in the Clerk and Recorder's Office, Missoula County Courthouse.

(See Maps in Part II, Pages 9, 10, 16, 17).

ORCHARD HOMES DITCH COMPANY

HISTORY

On March 3, 1907, R. M. Cobban and Samuel Dinsmore began using water from the Hellgate River for the irrigation of their lands which were commonly known as the Cobban and Dinsmore Orchard Homes. About a year prior to the use of this water, or on May 31, 1906, a corporation was formed under the name of the Orchard Homes Ditch Company for the purpose of selling, leasing and disposing of said water to the inhabitants of Orchard Homes and to any other persons who may desire the same.

Reincorporation papers were filed for the Ditch Company on April 20, 1946, extending the period of existence for another 40 years. The amount of capital stock of the Corporation totaled \$32,500, and is divided into 1,300 shares at a par value of \$25.00 per share. The Company is a nonprofit Corporation and at the present time (1959) has no indebtedness.

PRESENT STATISTICS

Location: Lands irrigated under the Orchard Homes Ditch are located in secs. 19, 20, and 21, T. 13 N., R. 19 W. in Cobban and Dinsmore subdivision of the city of Missoula.

Length and Capacity of Canal: The Orchard Home Ditch from its point of diversion on the left bank of the Clark Fork (Hellgate) River in the NE $\frac{1}{4}$ SE $\frac{1}{4}$ of sec. 21, T. 13 N., R. 19 W. follows a westerly direction for a distance of 1 mile, where it splits into 2 laterals; the north lateral is 1 mile in length and the south lateral 1 $\frac{3}{4}$ miles long. The initial capacity of the ditch is large enough to supply water for the 1,300 shares of stock in the Company, and provides the equivalent of 1 miner's inch per share of stock.

Operation and Maintenance: The Ditch Company has a minimum water charge of \$3.50 per acre per year or any fraction thereof, which includes the cost for operation and maintenance of the project.

Present Users: There are 824 $\frac{2}{3}$ active stock shares in the Company divided among 172 water users.

Acreage Irrigated: A total of 398.25 acres were irrigated by the Orchard Homes Ditch during the year of 1959. There are no potential irrigable acres under the ditch system.

WATER RIGHT DATA

Two water rights were filed and recorded that apply to the Orchard Homes Ditch Company. These rights are as follows: An appropriation from the Clark Fork (Hellgate) River by R. M. Cobban and Samuel Dinsmore for 2,000 miner's inches, dated May 2, 1900. (Ref. Book E of Water Rights, Page 426, Missoula County Courthouse); and an appropriation from the Clark Fork (Hellgate) River by the Orchard Homes Ditch Company for 1,300 miner's inches, dated June 7, 1926. (Ref. Book J of Water Rights, Page 241, Missoula County Courthouse). (See Maps in Part II, Page 16).

RATTLESNAKE VALLEY IRRIGATION COMPANY (Inactive)

HISTORY

The Rattlesnake Valley Irrigation Company became incorporated for a period of 40 years on September 26, 1919. Its purpose was to store surplus flood waters in three small lakes which would be used to supplement the landowners late priority water rights in the valley along Rattlesnake Creek. The lakes are located in the unsurveyed area at the head of High Falls Creek, a tributary of Rattlesnake Creek. When the lakes were first used, a special permit was issued by the U. S. Forest Service to the Company for the water storage. Later, when the area was surveyed and approved by the Surveyor General, it was found that the Northern Pacific Railway Company became owners of the land where the two Upper Twin Lakes were located. As the Forest Service had no further jurisdiction over the two upper lakes by landownership, their permit to the Rattlesnake Valley Irrigation Company was canceled.

On December 3, 1924, a motion was made at a Company meeting to assess each stockholder \$2.25 per share, to raise money to purchase from the Railway Company lots 3 and 4, E $\frac{1}{2}$ SW $\frac{1}{4}$ and the SE $\frac{1}{4}$ of sec. 31, T. 15 N., R. 18 W., comprising 315.65 acres. This land purchase contained the two upper lakes which were named the East and West Twin Lakes. The other lake, known as the Lower Lake, is leased to the Irrigation Company by a special use permit from the U. S. Forest Service.

Under the terms of the articles of incorporation, it was resolved that the Rattlesnake Valley Irrigation Company would not interfere with any of the established water rights in the Rattlesnake Creek drainage. The purpose was to store only the surplus flood waters and winter runoff when all other rights are not exercised. Whenever the other rights demand all of the flow of the stream, no water will be diverted for storage. The stored water is made available for irrigation purposes in the late summer, when the water flow in Rattlesnake Creek becomes insufficient to supply all of the rights on the stream.

On September 18, 1959, when the Company's charter expired, reincorporation papers were filed extending the term of existence for another 40 year period.

For the last 7 or 8 years this water storage project has become inactive due to a washout of the diversion headgates at the lakes. It is the intention of the Company to repair the headgates and have the system operating again in the near future.

PRESENT STATISTICS

Location: When the project was in operation a supplemental water supply was used on lands in the valley bordering Rattlesnake Creek in T. 13 N., R. 19 W.

Size and Capacity of Reservoir: Total water storage capacity of the three lakes is estimated at between 300 and 500 acre-feet.

Operation and Maintenance: The last official records of the Company in 1953 list an assessment of 50c for operation and maintenance on each share of stock owned, with one share representing the equivalent of one miner's inch of water. Company records at that time also showed a small bank balance and no outstanding debts.

Water Users: On April 10, 1953, the Irrigation Company had 23 active members, purchasing supplemental water for the irrigation of their land.

Acreage Irrigated: Water available to the landowners under this project was used entirely as a supplemental supply for the irrigation of land in the Rattlesnake Valley.

WATER RIGHT DATA

An extensive search of the water right information in Missoula County does not list any recorded filings on East and West Twin Lakes and Lower Lake for the storage of surplus flood waters by the Rattlesnake Valley Irrigation Company. It will then have to be assumed that the Company will base its claim to the storage of surplus flood waters upon a use right. From the early history of the East and West Twin Lakes and the Lower Lake they were known as the Effinger Lakes. A recorded filing was made by Sebastian Effinger for 150 miner's inches appropriated from West Twin Lake, dated August 28, 1905. Although this is the same West Twin Lake now owned and used for storage purposes by the Rattlesnake Valley Irrigation Company, the company does not claim the water right filing made by Sebastian Effinger.

WATER RIGHT DATA — MISSOULA COUNTY

APPROPRIATIONS AND DECREES BY STREAMS

APPROPRIATIONS (Filings of Record)				DECREED RIGHTS			
STREAM	No. of Filings	Miner's Inches	Cu. Ft. Per Sec.	Case No.	No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
COLUMBIA RIVER BASIN							
*CLARK FORK COLUMBIA (Hellgate, Missoula) RIVER	81	2,075,508	51,887.71	11246 ¹			
Unnamed Streams	4	500	12.50				
Strong Creek	1	60	1.50				
Certain Springs	1	All	All				
Cramer Creek	6	2,100	52.50	3959	3	825.00	20.63
Two Springs	2	80	2.00				
Unnamed Creek	1	All	All				
Beischel Creek	1	25	.63				
Rock Creek	12	99,828	2,495.70				
Gilbert Creek	2	2,900	72.50				
Kitchen Creek	1	100	2.50				
Beaver Creek	1	1,000	25.00				
Swiss Creek	1	100	2.50				
Starvation Creek	2	50	1.25				
Birch (Swartz) Creek	3	2,056	51.40				
Konnick Creek	1	20	.50				
A Spring	2	600	15.00				
Wallace, (Woodville, Camas Trail) Creek	8	1,300	32.50				
Erickson Creek	2	450	11.25				
North Camas Trail Creek	1	All	All				
Unnamed Spring	1	50	1.25				
Spring	2	80	2.00				
Johnson Creek	2	220	5.50				
Northey Creek	2	360	9.00				
Trail (Hoverson) Creek	3	280	7.00				
Sixty Springs	1	All	All				
Smith Creek	7	1,850	46.25	2655	3	All	All
A Spring	1	50	1.25				
Greenough Gulch	1	160	4.00				
Unnamed Spring	2	55	1.38				
Allen Creek	1	150	3.75				
Dirty Ike (Donovan) Creek	11	1,190	29.75	8396	4	225.00	5.63
Blue Grass Gulch (Kendall Creek)	1	1,000	25.00				
Spring Gulch	3	40	1.00				
Kallis Creek	5	270	6.75				
A Spring	1	50	1.25				
Yager Creek	1	300	7.50				
Crystal Creek	5	554	13.85				
A Spring	1	All	All				
Turah Creek	7	980	24.50	2711 & 7766	2	138.00	3.45
Unnamed Stream	1	15	.38				
Tamarack Creek	3	190	4.75				
Unnamed Spring	2	20	.50				
Bear Creek	3	550	13.75				
Nearman Creek	5	450	11.25				
Unnamed Stream	1	500	12.50				
Deer Creek	7	824	20.60	2830	2	200.00	5.00
Two Springs	1	50	1.25				
(Big) Blackfoot River	5	518,400	12,960.00				
Cottonwood (West Fork Shanley) Creek	6	4,060	101.50	28	3	1,560.00	39.00

*Names of streams indented on the left-hand margin indicate that they are tributaries of the first stream named above which is not indented.

WATER RIGHT DATA — MISSOULA COUNTY **APPROPRIATIONS AND DECREES BY STREAMS**

STREAM	APPROPRIATIONS (Filings of Record)			DECREED RIGHTS			
	No. of Filings	Miner's Inches	Cu. Ft. Per Sec.	Case No.	No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
Sharp Creek	3	1,000	25.00				
Bruce and Ernie's Creek	1	All	All				
Cott (Coty) Lake	3	500	12.50				
Unnamed Stream	1	500	12.50				
Clearwater River or Creek	17	14,060	351.50				
Bertha Creek	0	0	0				
Summit Springs	1	10	.25				
A Spring and Creek	1	1	.03				
Camp (Inez) Creek	2	500	12.50				
Unnamed Spring	1	All	All				
Murphy Creek	2	160	4.00				
Benedict Creek	2	260	6.50				
Sawyer (Dry) Creek	3	380	9.50				
Buck Creek	1	23,100	577.50				
Rice Creek	1	100	2.50				
Deer Creek	3	438	10.95				
Auggie Creek	1	2	.05				
Seeley Creek	2	480	12.00				
Gretchen's Pond	1	All	All				
Morrell (E. Fork Clear- water River) Creek	5	6,124	153.10				
Trail Creek	3	4,000	100.00				
Dreu (Marshall) Creek	1	150	3.75				
Owl Creek	0	0	0				
Placid Lake	0	0	0				
Placid Creek	3	650	16.25				
Niagara Creek	1	1,280	32.00				
Finley Creek	0	0	0				
Unnamed Spring and Creek	1	All	All				
Owl (Bowles) Creek	2	950	23.75				
A Spring	1	All	All				
Fish Creek	2	700	17.50				
Spring Creek	1	200	5.00				
Lodge Pole Creek	2	80	2.00				
Blanchard Creek	0	0	0				
West Fork Blan- chard Creek	4	3,360	84.00				
Cold Brook Creek	3	1,270	31.75				
Total Clearwater River and Tributaries	67	58,255	1,456.38				
Spring	3	600	15.00				
Fish Creek	10	10,100	252.50				
Spring Creek	1	200	5.00				
Spring	1	80	2.00				
Elk Creek	15	4,190	104.75	7956	5	1,300.00	32.50
Springs	7	220	5.50				
Spring Creek	1	All	All				
Soft Pit Gulch	1	All	All				
Keno (Thigo) Creek	1	All	All				
Shanghai Gulch	1	100	2.50				
Marsh Creek	1	250	6.25				
Cunningham Gulch	4	125	3.13				
Boulder Creek	1	1,000	25.00				
A Spring	1	All	All				

WATER RIGHT DATA — MISSOULA COUNTY

APPROPRIATIONS AND DECREES BY STREAMS

STREAM	APPROPRIATIONS (Filings of Record)			DECREED RIGHTS			
	No. of Filings	Miner's Inches	Cu. Ft. Per Sec.	Case No.	No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
Schrimmerhorn Gulch	5	210	5.25				
Day's Gulch	2	75	1.88				
Slaughterhouse Gulch	2	150	3.75				
Cap Wallace Gulch	2	50	1.25				
A Spring	2	175	4.38				
Unnamed Spring and Creek	1	100	2.50				
Black Canyon Creek	4	500	12.50				
Four Springs	3	5,635	140.88				
Lake Creek	3	1,240	31.00				
Belmont Creek	2	200	5.00				
A Creek	1	30	.75				
Spring Creek	1	200	5.00				
Gold Creek	5	4,900	122.50				
West Fork Gold Creek	4	8,500	212.50				
Unnamed Spring	1	5	.13				
Spring Creek	2	550	13.75				
Burnt Bridge Creek	1	50	1.25				
Warm Spring Creek	3	750	18.75				
Union Creek	20	5,135	128.38	12038	17	2,112.00	52.80
Beaton Creek	1	300	7.50				
Washoe Creek	3	550	13.75				
Swanson Spring	1	40	1.00				
Camas Creek	4	850	21.25	12038		(See Union Creek)	
A Lake	1	All	All				
Ashby (Ashley) Creek	2	325	8.13	12038		(See Union Creek)	
East Fork Ashby (Ashley) Creek	1	20	.50				
Arkansas Creek	2	700	17.50	12038		(See Union Creek)	
Spring Gulch	1	50	1.25				
Dikeman Spring	1	50	1.25				
Blixit Creek	1	3,200	80.00	12038		(See Union Creek)	
Nelson (Camp) Creek	0	0	0	12038		(See Union Creek)	
Bear (Spring Brook) Creek	8	1,160	29.00				
East Twin Creek	5	3,306	82.65				
West Twin Creek	10	2,765	69.13				
Wagner Gulch	1	100	2.50				
Tamarack Creek	1	100	2.50				
Unnamed Stream	1	60	1.50				
Falls Creek	1	160	4.00				
Demmons (St. Lawrence) Creek	2	30	.75	5246	3	72.00	1.80
Park Creek	3	300	7.50				
Unnamed Spring	1	100	2.50				
Johnson Creek	5	2,400	60.00				
Unnamed Stream	6	1,175	29.38				
Total (Big) Blackfoot River and Tributaries	260	645,776	16,144.40		28	5,044.00	126.10
Richlie Spring	1	10	.25				
Marshall Creek	6	970	24.25				
Unnamed Creek	1	All	All				
A Spring	5	360	9.00				
Rattlesnake Creek	36	12,273	306.85	1953	17	4,088.00	102.20
Unnamed Streams	1	150	3.75				
Maurice Creek	1	2,304	57.60				
Bune Creek	1	100	2.50				
Lakes	19	12,601	315.03				
Grizzly Creek	3	224	5.60				

WATER RIGHT DATA — MISSOULA COUNTY

APPROPRIATIONS AND DECREES BY STREAMS

STREAM	APPROPRIATIONS (Filings of Record)			DECREED RIGHTS			
	No. of Filings	Miner's Inches	Cu. Ft. Per Sec.	Case No.	No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
Lime Kiln Gulch.....	2	350	8.75				
A Spring	1	All	All				
Spring Gulch	3	360	9.00				
Kesner Creek	2	152	3.80				
A Spring	2	3075				
Coal Pit Creek in Wood's Gulch	3	107	2.68				
Sawmill Creek	0	0	0				
A Spring	2	60	1.50				
Bear Creek	1	All	All				
Spring Gulch	6	80	2.00				
Coal Creek	2	All	All				
Spring	4	400	10.00	3031	2	All	All
Cherry Creek	3	70	1.75				
Total of Rattlesnake Creek and Tributaries	92	29,262	731.55		19	4,088.00	102.20
Waste	1	All	All				
Grant Creek	27	18,528	463.20	5504	28	4,078.00	101.95
Unnamed Springs	4	165	4.13				
Well	1	196	4.90				
Three Certain Springs	3	375	9.38				
Waste	4	770	19.25				
Bitterroot River	10	9,725	243.13				
Woodchuck Creek	3	720	18.00				
North Woodchuck Creek	1	1,000	25.00				
South Woodchuck Creek	1	500	12.50				
One Horse (Squaw) Creek	5	5,000	125.00				
Three Lakes	1	880	22.00				
Carlton Creek	10	3,650	91.25	1835	21	1,925.00	48.13
Unnamed Spring	5	105	2.63				
Springs	3	140	3.50				
McLain Creek	3	400	10.00				
Three Springs	1	All	All				
Maple Creek	3	350	8.75				
Lost Creek	3	950	23.75				
A Spring	4	40	1.00				
Lolo Creek	43	47,107	1,177.68	12336	39	7,432.00	185.80
Granite Creek	0	0	0	12336	(See Lolo Creek)		
Lolo Hot Springs	1	All	All				
Howard Creek	0	0	0				
Merrill Creek	1	16,000	400.00				
South Fork Lolo Creek	6	2,580	64.50	12336	(See Lolo Creek)		
Graves Creek	3	650	16.25				
Bear Creek	1	160	4.00				
Unnamed Spring	1	1025				
Woodman Creek	2	400	10.00				
Spring	1	All	All				
Mill Creek	8	3,212	80.30	12336	(See Lolo Creek)		
Lolo Peak Lake	1	500	12.50				
Johnny Creek	1	200	5.00	12336	(See Lolo Creek)		
Unnamed Pond or Reservoir	1	80	2.00				
Sleeman Creek	3	560	14.00				
Mormon Creek	5	3,150	78.75	12336	(See Lolo Creek)		
Sawyer Creek	1	800	20.00				
Springs	5	395	9.88				
Deadman's Gulch	5	270	6.75				

WATER RIGHT DATA — MISSOULA COUNTY

APPROPRIATIONS AND DECREES BY STREAMS

STREAM	APPROPRIATIONS (Filings of Record)			DECREED RIGHTS			
	No. of Filings	Miner's Inches	Cu. Ft. Per Sec.	Case No.	No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
Spring	2	18	.45				
Miller Creek	14	6,141	153.53	1826	12	1,372.00	34.30
Spooner Creek	4	250	6.25				
Golden Gulch Spring ..	1	15	.38				
A Spring	1	5	.13				
Howard Creek	1	50	1.25				
Dagert Creek	1	25	.63				
A Spring	4	200	5.00				
Buckhouse (Hayes) Creek	6	765	19.13				
Underground Water	1	500	12.50	575	3	100.00	2.50
Pine Hollow	4	130	3.25				
Pattee Creek	4	625	15.63				
Spring	1	2	.05				
Fourth of July Creek ..	1	All	All				
Four Springs	1	50	1.25				
A Spring	2	50	1.25				
North Fork Pattee Creek	1	100	2.50				
Gorman Spring	2	150	3.75				
Springs	2	10	.25				
Dry Gulch (Miners Creek) ..	2	100	2.50				
Springs	6	220	5.50				
Fairground Creek	2	24	.60				
Mack Creek	1	40	1.00				
A Spring	1	240	6.00				
Pulliam Creek	2	260	6.50				
O'Brien Creek	3	1,600	40.00	2438	4	390.00	9.75
Lyon Gulch	1	120	3.00				
Total Bitterroot River and Tributaries	213	111,224	2,780.60		79	11,219.00	280.48
Two Springs	1	All	All				
Butler Creek	4	2,100	52.50				
Springs	3	20	.50				
Martin Creek	2	1,000	25.00				
Springs	1	200	5.00				
Dusseault Creek	3	1,800	45.00				
Jette Drain	1	500	12.50				
Lazasse Creek	3	900	22.50				
A Spring	1	30	.75				
Sherman (Lime) Creek ..	2	300	7.50				
Sol's Slough	3	550	13.75				
Deep Creek	4	2,050	51.25				
West Fork Deep Creek ..	1	160	4.00				
Spring	2	2	.05				
Unnamed Creek ..	1	200	5.00				
Cald Eell Creek ..	1	All	All				
LaValle Creek	11	4,912	122.80				
Unnamed Stream	1	300	7.50				
Primrose Drain	1	100	2.50				
O'Keefe Creek	8	898	22.45	5284	10	593.00	14.83
Unnamed Creek ..	1	500	12.50				
McCormick Creek	2	26	.65				
Unnamed Springs	1	5	.13				
Perry Creek	1	All	All				
Johnson Creek	2	160	4.00				
Springs	2	500	12.50				
Albert Creek	4	1,900	47.50				
A Spring	7	295	7.38				

WATER RIGHT DATA — MISSOULA COUNTY
APPROPRIATIONS AND DECREES BY STREAMS

STREAM	No. of Filings	APPROPRIATIONS (Filings of Record)		DECREED RIGHTS			
		Miner's Inches	Cu. Ft. Per Sec.	Case No.	No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
Mill Creek	13	4,345	108.63	2858	3	670.00	16.75
Distillery Creek	1	50	1.25				
Bear Creek	2	1,224	30.60				
Perreault Spring	3	225	5.63				
Warren Creek	1	500	12.50				
Black Hawk Creek	1	300	7.50				
Edith Creek	1	500	12.50				
Spencer Spring	4	110	2.75				
Brown Creek	4	2,105	52.63				
Unnamed Spring	2	575	14.38				
Houlle Creek	3	350	8.75				
Montana Lake	2	100	2.50				
Tie Creek	1	300	7.50				
Several Springs	2	150	3.75				
Unnamed Creek	1	15	.38				
A Spring	1	All	All				
Six Mile Creek	17	8,290	207.25				
Isaac (West Fork Six Mile) Creek	6	1,500	37.50				
Unnamed Creek	2	20	.50				
Tank Creek	1	1,000	25.00				
Mountain Creek	2	All	All				
Nine Mile Creek	37	47,836	1,195.90	11922	9	1,609.00	40.23
Squaw Gulch Creek	1	300	7.50				
Town Creek	1	All	All				
Unnamed Stream	9	4,064	101.60				
Unnamed Creeks	6	2,700	67.50				
Eustache Creek	9	4,290	107.25				
Snow Shoe Gulch	3	500	12.50				
California Gulch	2	All	All				
Oliver Creek	5	2,100	52.50				
Devils Creek	1	400	10.00				
St. Louis Creek	12	5,130	128.25				
Spanish Gulch	1	300	7.50				
Sawpit Creek	6	7,920	198.00				
Beecher Creek	1	300	7.50				
East Fork Beecher Creek	1	250	6.25				
Martina Creek	1	300	7.50				
Burnt Fork Creek	4	1,010	25.25	11922	(See Nine Mile Creek)		
Mattie V. Creek	3	1,050	26.25				
Soldier Creek	3	750	18.75				
Soldier Creek Spring	1	All	All				
Camp Creek	6	1,900	47.50				
Big Blue Creek	4	12,600	315.00				
Little Blue Creek	1	600	15.00				
Dawson Creek	2	20	.50				
Bird Creek	4	1,730	43.25	11922	(See Nine Mile Creek)		
Big Pine Creek	10	5,524	138.10	11922	(See Nine Mile Creek)		
Little Pine Creek	2	1,300	32.50				
Big Marion Creek	5	2,400	60.00				
Little Marion Creek	2	800	20.00				
Osburn's Reservoir	1	300	7.50				
Moncure (Shady) Creek	4	90	2.25				
Petty (Josephine) Creek	3	675	16.88				
Raspberry Creek	1	200	5.00				
McCormick Creek	14	5,445	136.13				
Fire Creek	1	20	.50				
Harris (Nowlin) Creek	1	160	4.00	11922	(See Nine Mile Creek)		
Kennedy Creek	10	5,724	143.10	12966	2	175.00	4.38

WATER RIGHT DATA — MISSOULA COUNTY

APPROPRIATIONS AND DECREES BY STREAMS

STREAM	APPROPRIATIONS (Filings of Record)			DECREED RIGHTS			
	No. of Filings	Miner's Inches	Cu. Ft. Per Sec.	Case No.	No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
A Spring	3	610	15.25	11922	(See Nine Mile Creek)		
Cedar Creek	3	1,000	25.00				
Unnamed Creek	1	200	5.00				
Unnamed Spring	1	All	All				
Free Creek	1	All	All				
Unnamed Spring	1	All	All				
Butter (Butler) Creek	14	11,588	289.70				
Spring Gulch	1	100	2.50				
Stony (Rock, Ballard, Four Mile) Creek	9	7,928	198.20				
Stephens Creek	1	240	6.00				
Goose Creek	2	260	6.50				
Rennick (Niece) Creek	2	400	10.00				
Meadow Creek	1	10	.25				
A Spring	1	All	All				
Deer Creek	3	1,100	27.50				
Rock Creek	8	6,810	170.25	16380	2	75.00	1.88
Blanchard Gulch	1	200	5.00				
Total Nine Mile Creek and Tributaries	231	149,134	3,728.35		13	1,859.00	46.48
Tommie Creek	2	150	3.75				
Two Springs	2	33	.83				
Petty Creek	12	47,520	1,188.00				
East Fork Petty Creek	4	2,030	50.75				
South Fork Petty Creek	1	1,280	32.00				
Lake Harry	1	All	All				
Mike's Creek	2	900	22.50				
Bill's Creek	1	300	7.50				
John's Creek	1	300	7.50				
Gus Creek	1	All	All				
Ed's Creek	1	All	All				
West Fork Petty Creek	3	1,000	25.00				
Spring Creek	1	25	.63				
A Spring	1	16,000	400.00				
Monahan Spring	1	250	6.25				
Flathead River	0	0	0				
Swan River	4	3,240	81.00				
Beaver Creek	3	1,780	44.50				
Mt. Baker Creek	1	1,280	32.00				
Bob Creek	1	150	3.75				
Holland Creek	3	3,200	80.00				
Owl Creek	1	200	5.00				
Colt Creek	1	60	1.50				
Spring Creek	3	560	14.00				
Barber Creek	3	1,060	26.50				
Rumble Creek	7	710	17.75				
Cooney Creek	4	800	20.00				
Glacier Creek	8	3,218	80.45				
Loon Lake	1	160	4.00				
Lake Lavoie	1	160	4.00				
Windfall Creek	1	155	3.88				
Unnamed Creek	2	450	11.25				
Elk Creek	2	310	7.75				
Unnamed Creek	1	155	3.88				
Condon Creek	3	1,068	26.70				
Falls Creek	2	920	23.00				
Smith Creek	2	280	7.00				
Dog Creek	1	600	15.00				

WATER RIGHT DATA — MISSOULA COUNTY
APPROPRIATIONS AND DECREES BY STREAMS

STREAM	APPROPRIATIONS (Filings of Record)			DECREED RIGHTS			
	No. of Filings	Miner's Inches	Cu. Ft. Per Sec.	Case No.	No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
Jocko River	0.....	0	0				
Agency Creek	5.....	16,170	404.25				
Big Knife Creek	1.....	4,000	100.00				
McClure Creek	1.....	80	2.00				
Finley Creek	4.....	4,256	106.40	11833 ..	4 ..	192.10 ..	4.80 ..
Evaro (South Fork Finley) Creek	2.....	170	4.25				
Unnamed Stream	3.....	8,000	200.00				
East Finley Creek	1.....	20,000	500.00				
Unnamed Stream	2.....	230	5.75				
Total Flathead River and Tributaries	74	73,422	1,835.55		4	192.10 ..	4.80 ..
Grand Total	1,293	3,337,962	83,449.26		198	29,131.10 ..	728.31 ..

¹A "Ditch Decree," defining the capacity and water rights pertaining to a particular ditch system.

UNKNOWN STREAMS IN MISSOULA COUNTY NOT LOCATED

STREAM	No. of Filings	Miner's Inches	Cu. Ft. Per. Sec.
Alder Creek	1	100	2.50
Bald Eagle Creek	1	200	5.00
Bangor Creek	2	2,008	50.20
Little Bear Creek	1	200	5.00
Bear Gulch Creek	1	1,000	25.00
Unnamed Stream	2	250	6.25
Clinton Creek	1	250	6.25
M. F. Davis Creek	1	1,000	25.00
Elk Creek	1	200	5.00
Finch Creek	1	All	All
Five Mile Creek	1	1,000	25.00
Florence Creek	1	300	7.50
A Spring	1	15	.38
Frazer Creek	1	200	5.00
Garrison, Ruby and Old Timer Gulches	1	1,500	37.50
Little Granite Creek	1	40	1.00
Granite Gulch	1	500	12.50
Grass Valley Creek	1	160	4.00
Jonathan Creek	3	1,100	27.50
Sun Lake	1	200	5.00
Six Certain Lakes	1	All	All
Unnamed Lakes	3	3,840	96.00
Last Chance Creek	1	100	2.50
Louis, Loves, Lovis, Gulch	1	25	.63
Madison Creek	1	200	5.00
Norman Creek	1	200	5.00
Number Three Gulch	1	All	All
Oil Creek	1	1,000	25.00
Orchard Creek	1	200	5.00
Provan Creek	1	300	7.50
Ravalli Creek	1	All	All
Rich Creek	1	25	.63
Ritchie Creek	1	250	6.25
Siddy Creek	1	1,200	30.00
Silver King Creek	1	All	All
Smoke Gulch	1	16	.40
Spring in Sores Gulch	1	25	.63
Sour Dough Tom Creek	1	All	All
Carlo Springs	1	All	All
Choats Spring	1	100	2.50
Golden Glen Springs	1	5	.13
Limestone Springs	1	75	1.88
Mountain View Spring	1	All	All
Unnamed Springs	13	2,260	56.50
Suedemeyer Gulch	1	All	All
Trail Creek	1	100	2.50
Twin Creek	1	300	7.50
Vermont Gulch	1	500	12.50
Warm Springs Creek	1	168	4.20
Willow Creek	1	500	12.50
Wild Rose Creek	1	All	All
Williams Creek	1	All	All
Wolf Creek	1	All	All
Unnamed Creek	11	6,736	168.40
Unnamed Slough	2	100	2.50
Total	84	28,448	711.23

WATER RESOURCES SURVEY

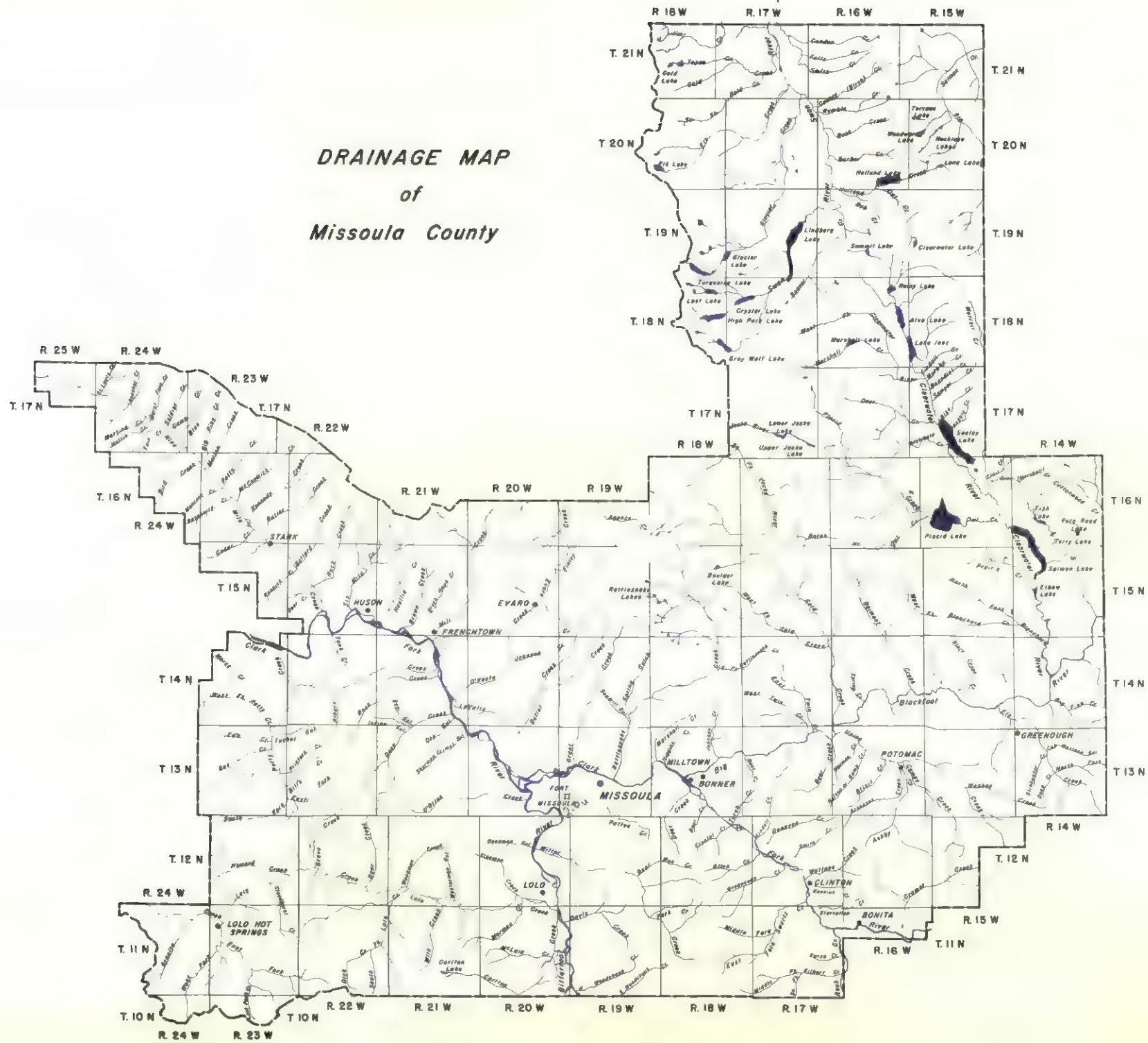
Missoula County, Montana

Part II

Maps Showing Irrigated Areas

Published by
STATE ENGINEER'S OFFICE
Helena, Montana
June, 1960

DRAINAGE MAP
of
Missoula County



MAP INDEX

Township	Range	Page	Township	Range	Page
11 North	16 West	1	14 North	16 West	22
11 North	17 West	2	14 North	17 West	23
11 North	18 West	3	14 North	19 West	24
11 North	19 West	3	14 North	20 West	25
11 North	20 West	4	14 North	21 West	26
11 North	21 West	5	14 North	22 West	27
11 North	23 West	6	14 North	23 West	28
12 North	17 West	7	15 North	15 West	21
12 North	18 West	8	15 North	20 West	29
12 North	19 West	9	15 North	21 West	30
12 North	20 West	10	15 North	22 West	31
12 North	21 West	5	15 North	23 West	31
13 North	14 West	11	16 North	14 West	32
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13 North	16 West	13	16 North	19 West	34
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13 North	19 West	16	16 North	24 West	35
13 North	20 West	17	17 North	15 West	36
13 North	21 West	18	17 North	23 West	35
13 North	22 West	19	19 North	16 West	37
13 North	23 West	19	20 North	16 West	38
14 North	14 West	20	20 North	17 West	39
14 North	15 West	21			

ALL MAPS HAVE BEEN MADE FROM AERIAL PHOTOGRAPHS

MAP SYMBOL INDEX

BOUNDARIES

- COUNTY LINE
- NATIONAL FOREST LINE

DITCHES

- ~ CANALS OR DITCHES
- > DRAIN DITCHES
- > PROPOSED DITCHES

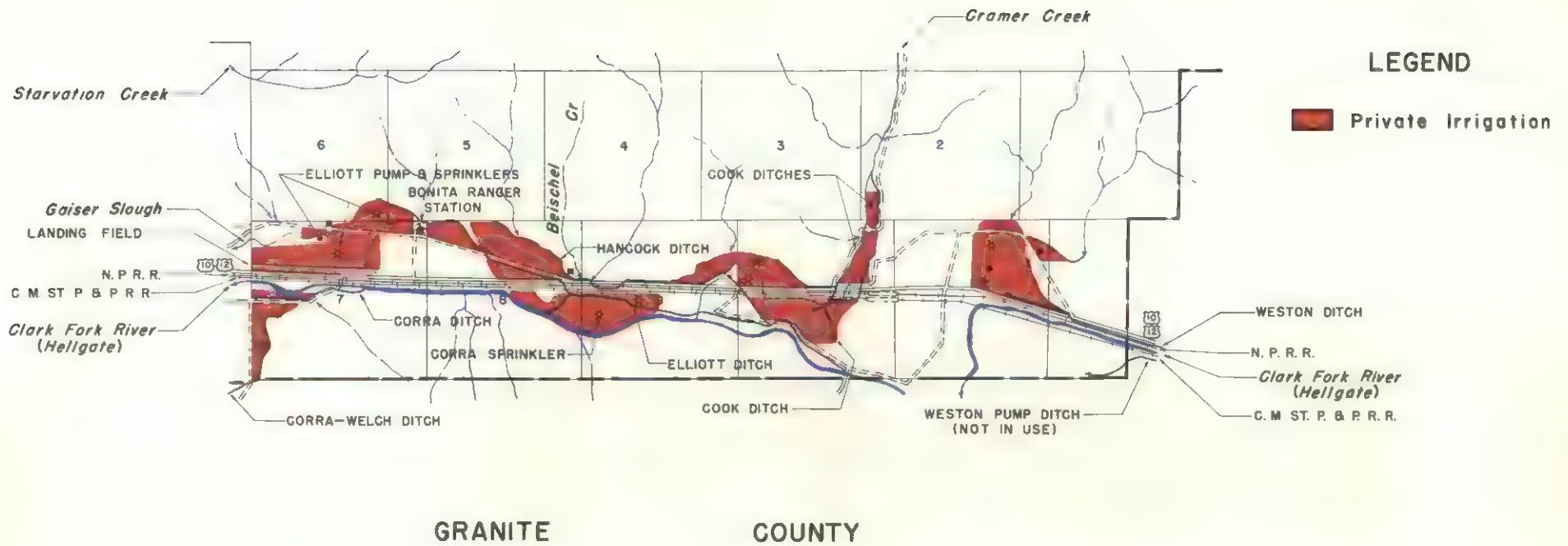
STRUCTURES & UNITS

- \ DAM
- 3 DIKE
- † FLUME
- †† SIPHON
- † SPILL
- ☆ SPRINKLER SYSTEM
- ∟ WEIR
- == PIPE LINE
- PUMP
- PUMP SITE
- ⊖ RESERVOIR
- ⊖ WELL
- +++ NATURAL CARRIER USED AS DITCH

TRANSPORTATION

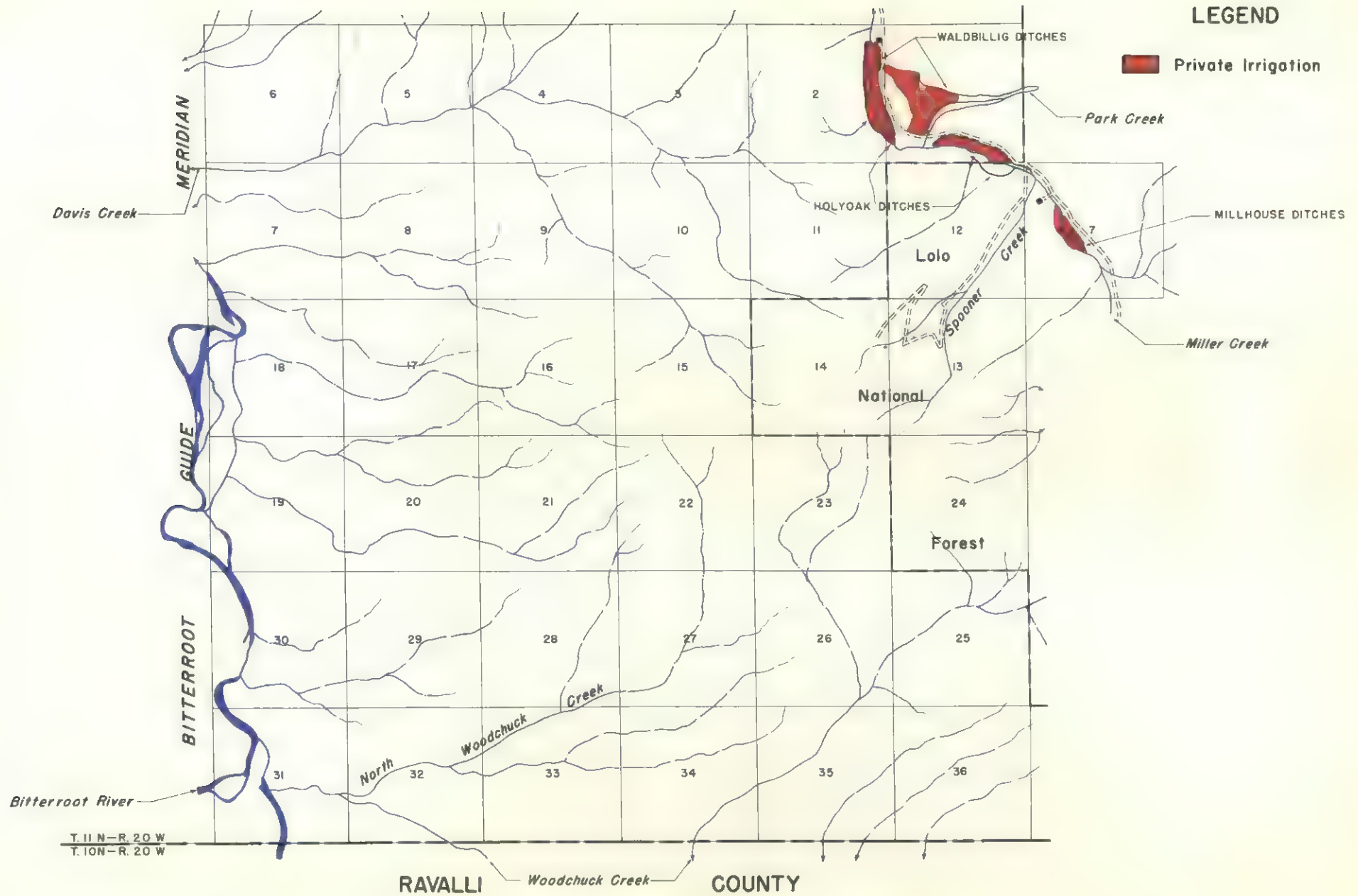
- == PAVED ROADS
- === UNPAVED ROADS
- +++ RAILROADS
- 10 STATE HIGHWAY
- 69 U.S. HIGHWAY
- ◇ AIRPORT

- * SPRING
- ⋈ SWAMP
- ⊙ GAUGING STATION
- ▲ POWER PLANT
- ⊙ STORAGE TANK
- ⊠ CEMETERY
- ⊙ FAIRGROUND
- FARM OR RANCH UNIT
- ⬆ LOOKOUT STATION
- ⬆ RANGER STATION
- - - RAILROAD TUNNEL
- ⬆ SCHOOL
- ⋈ SHAFT, MINE, OR DRIFT



LEGEND

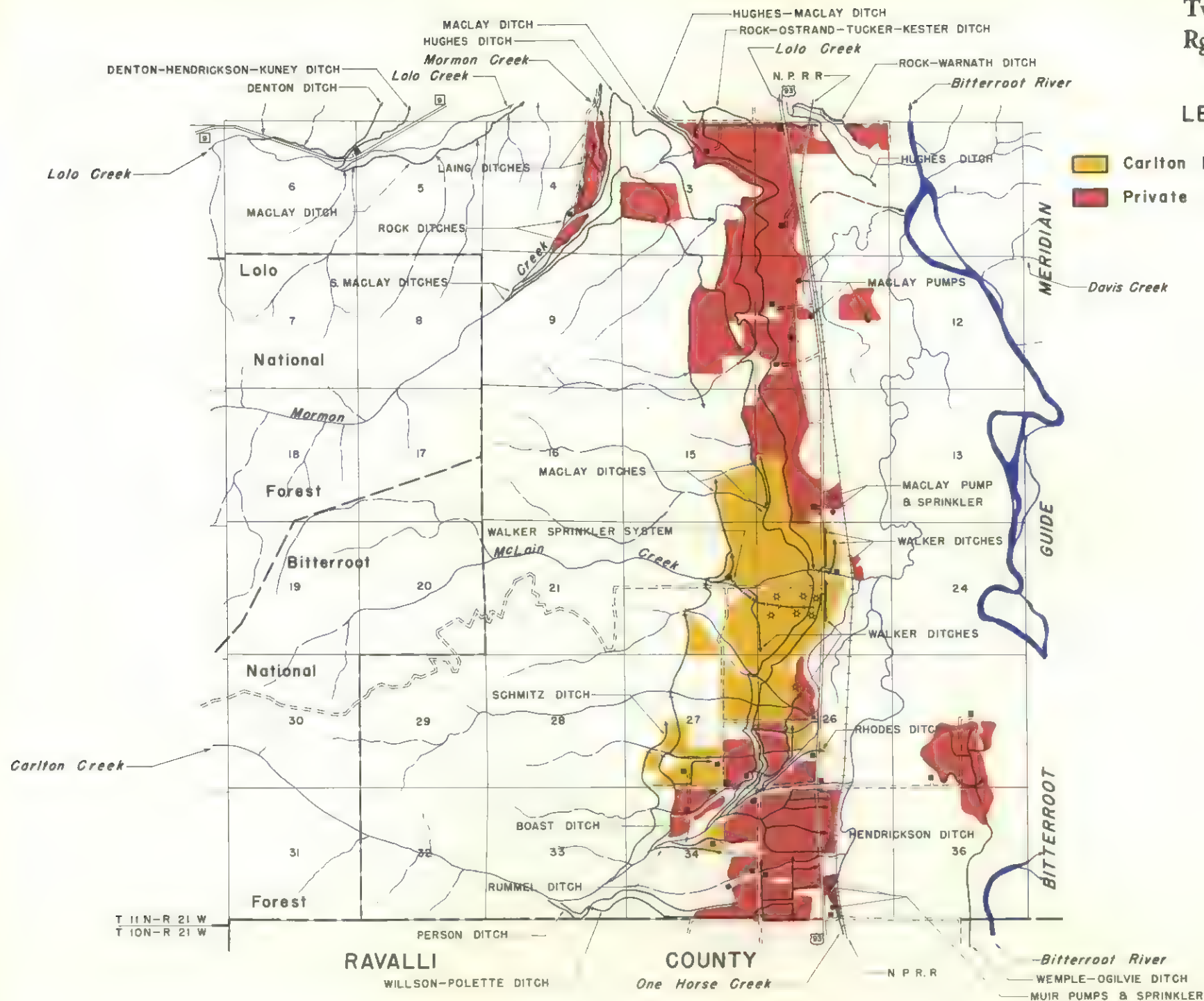


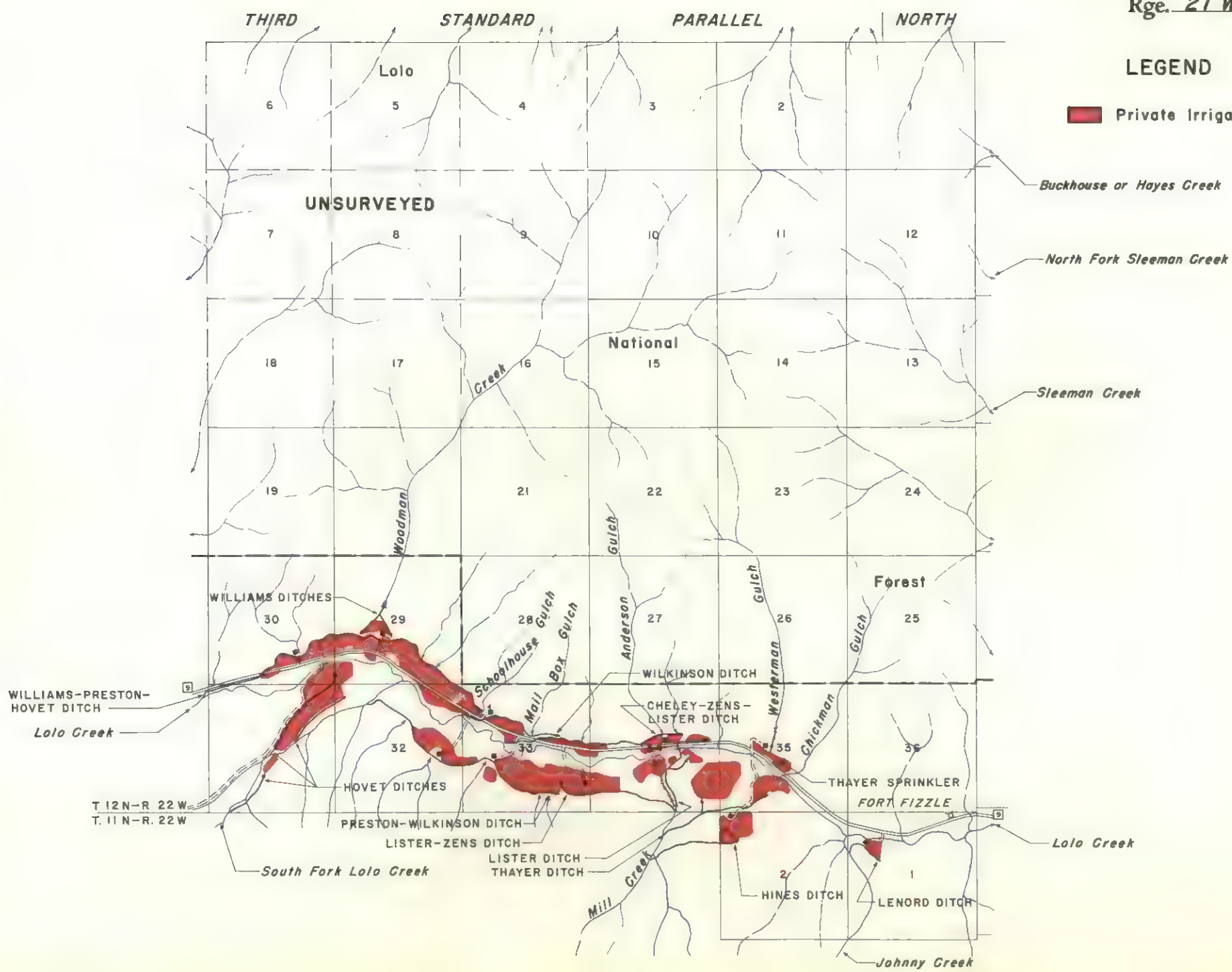


Twp. 11 NORTH
Rge. 20 WEST

LEGEND

-  Carlton Irrigation Company
-  Private Irrigation

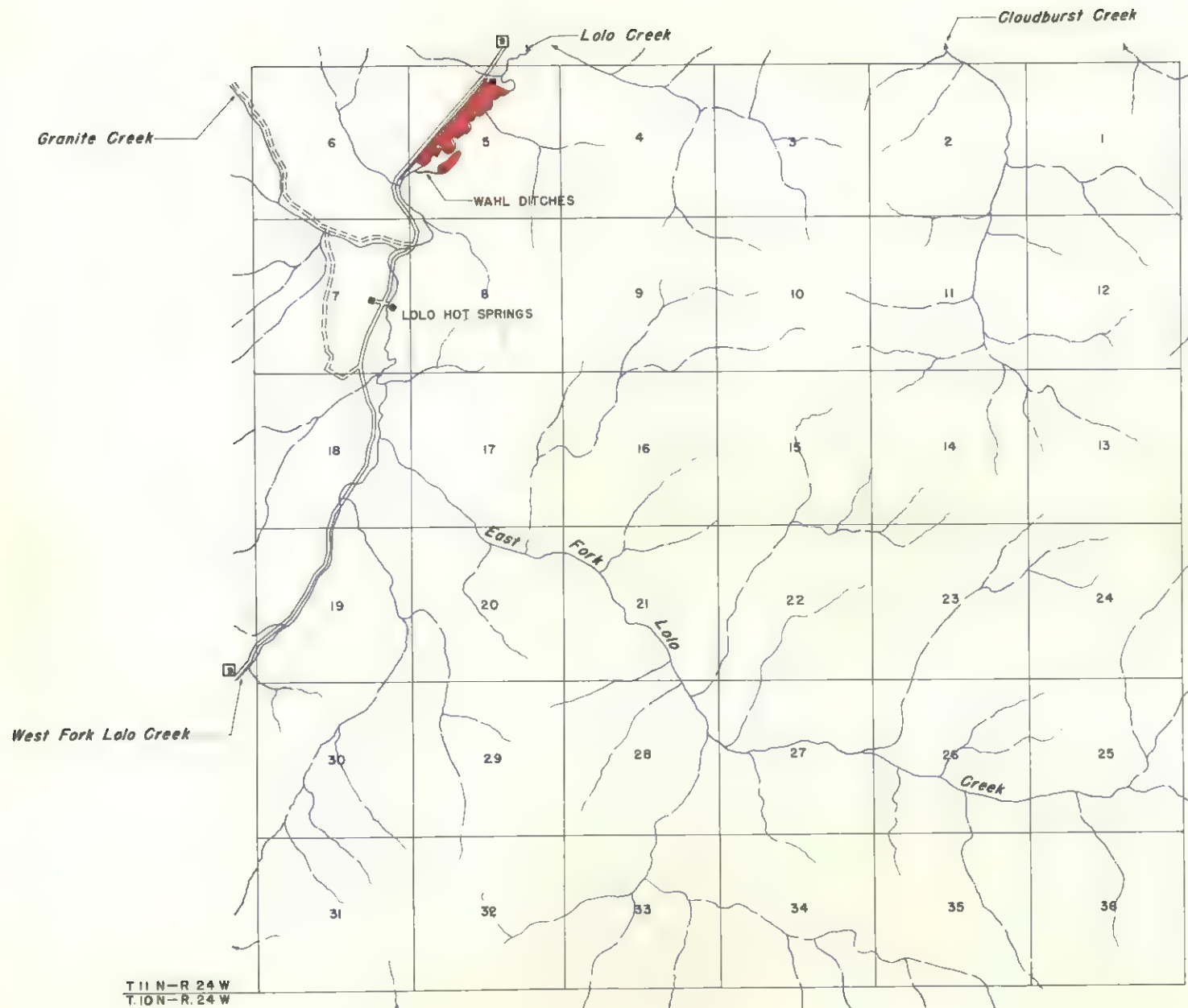


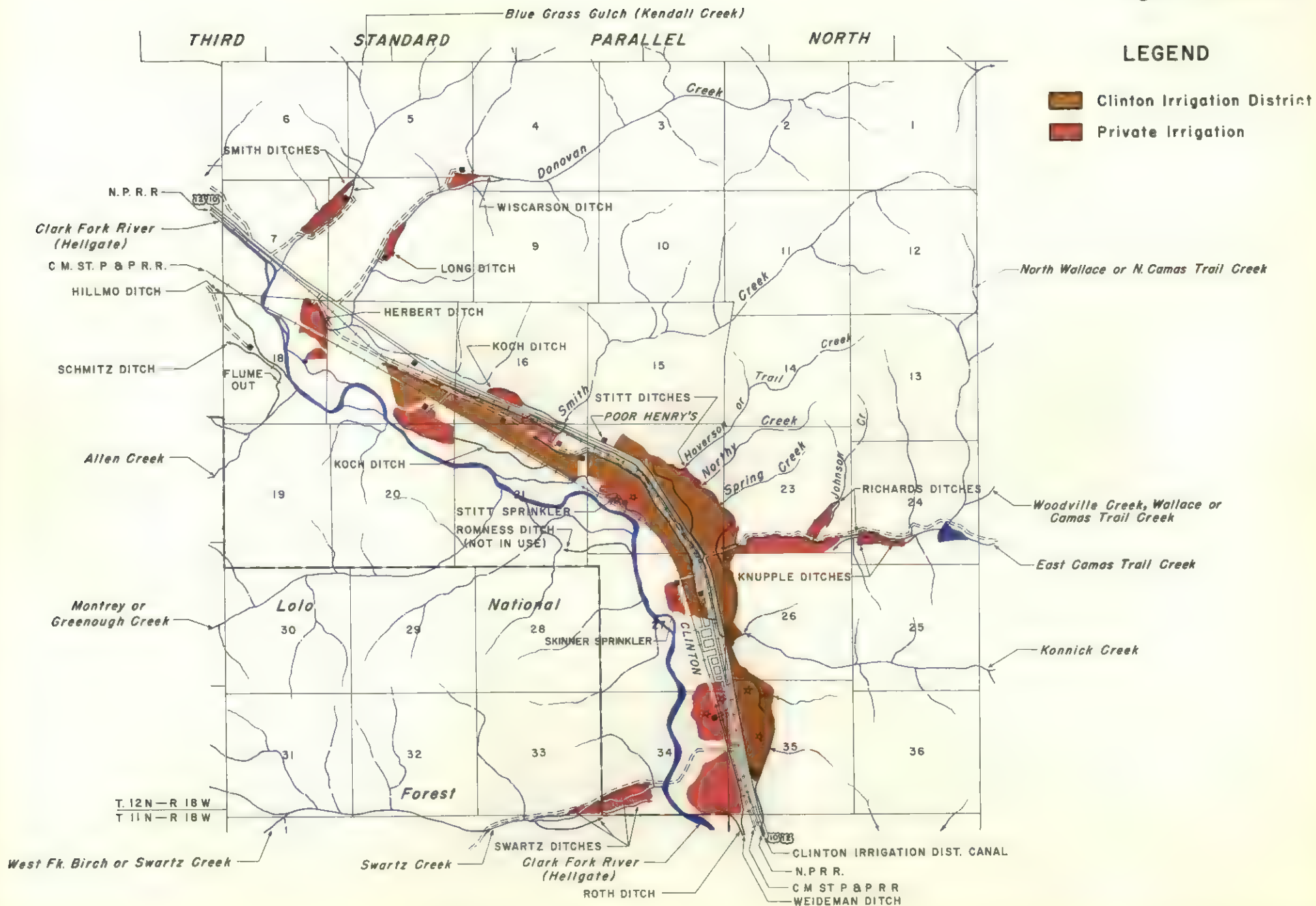


Twp. 11 NORTH
Rge. 23 WEST

LEGEND

 Private Irrigation

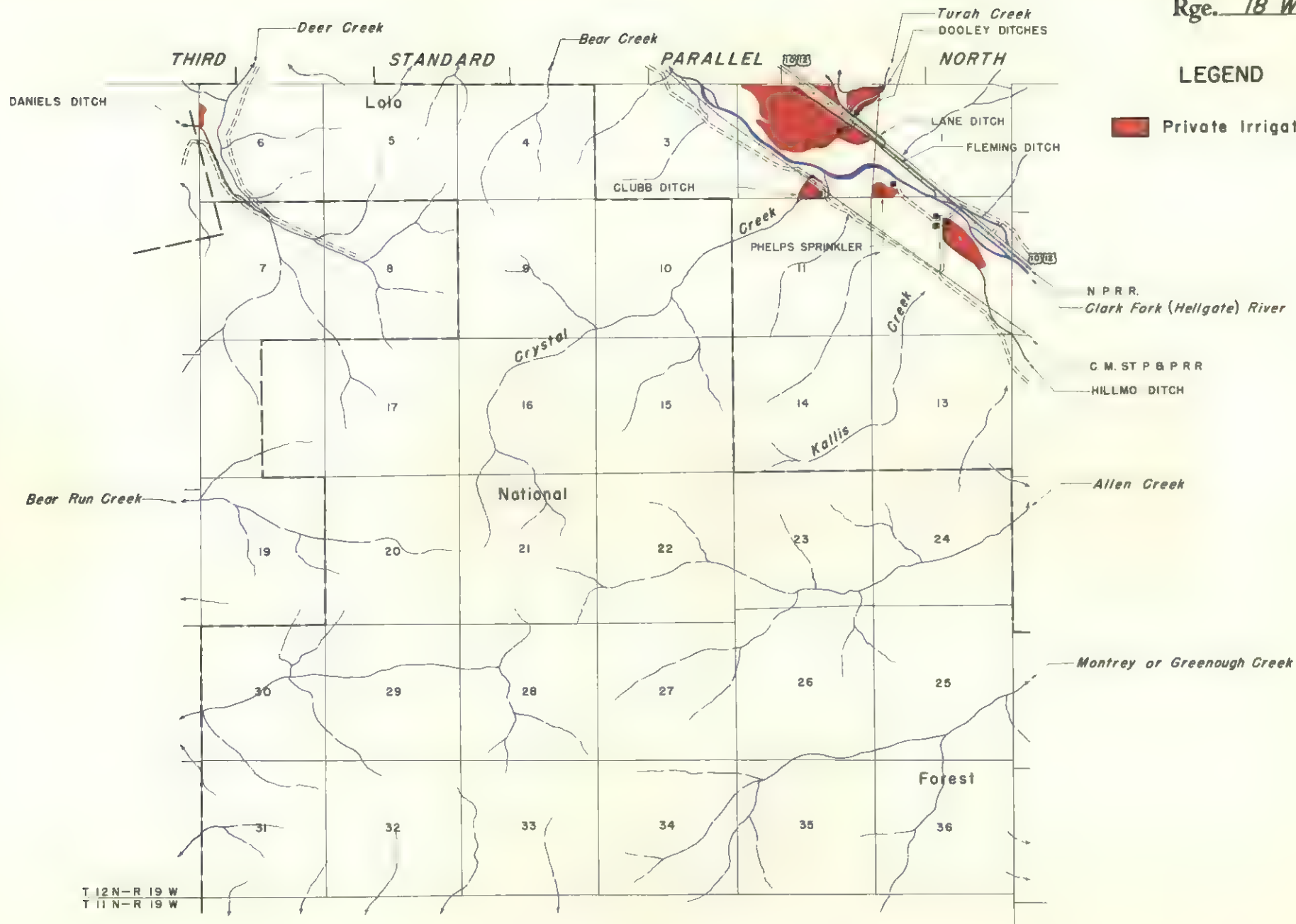




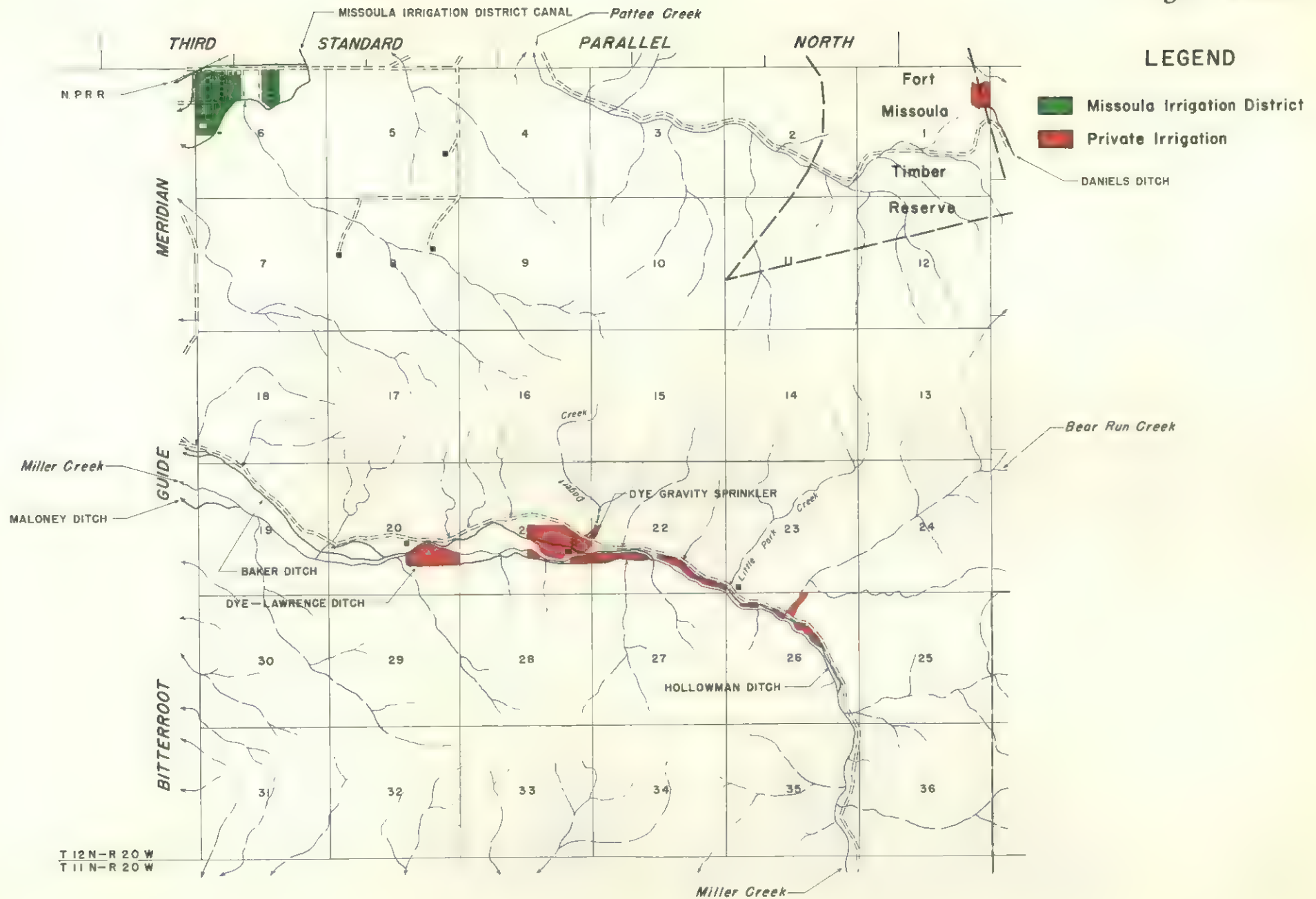
Twp. 12 NORTH
Rge. 18 WEST

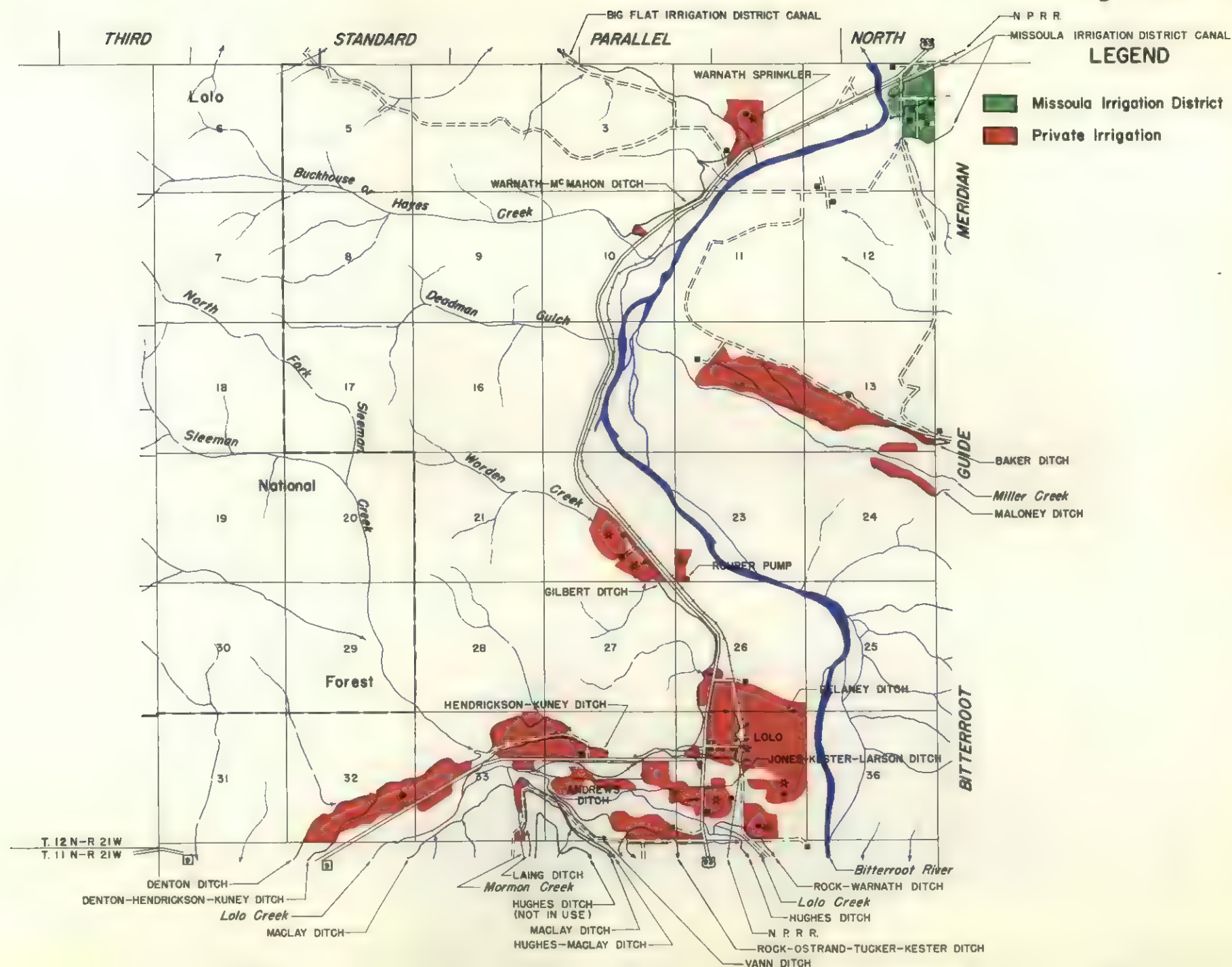
LEGEND

 Private Irrigation



Twp. 12 NORTH
Rge. 19 WEST

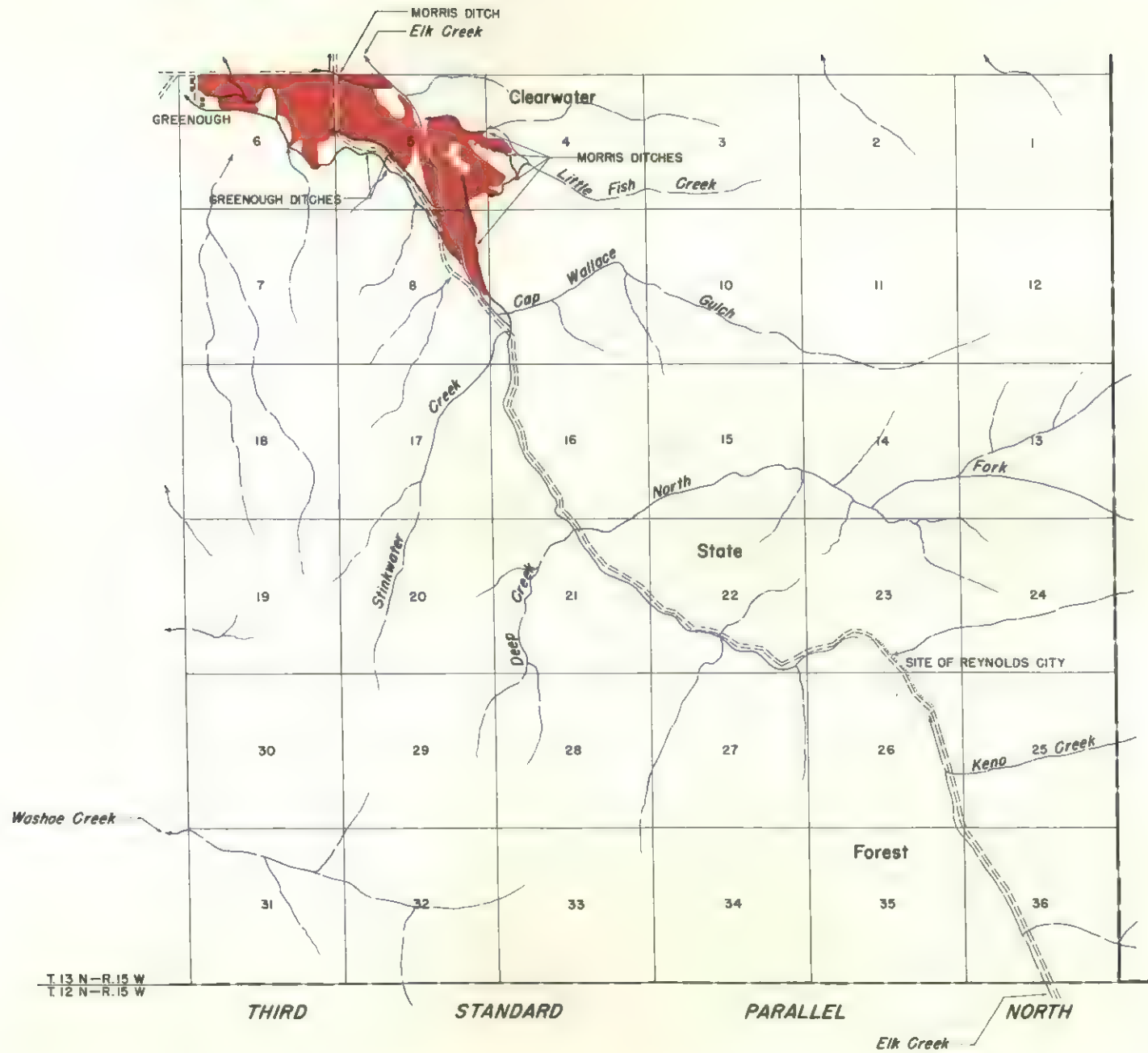




Twp. 13 NORTH
Rge. 14 WEST

LEGEND

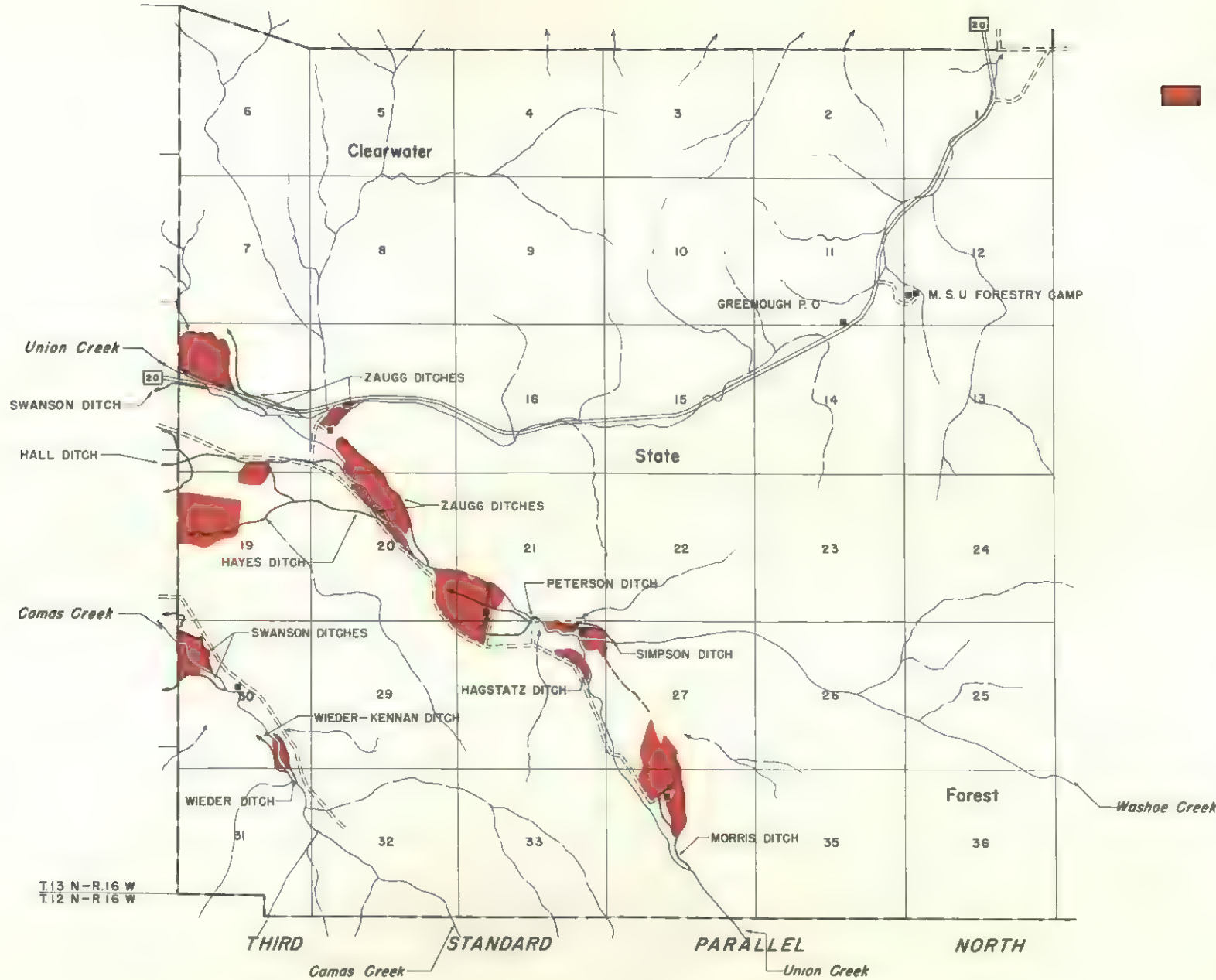
 Private Irrigation



POWELL COUNTY

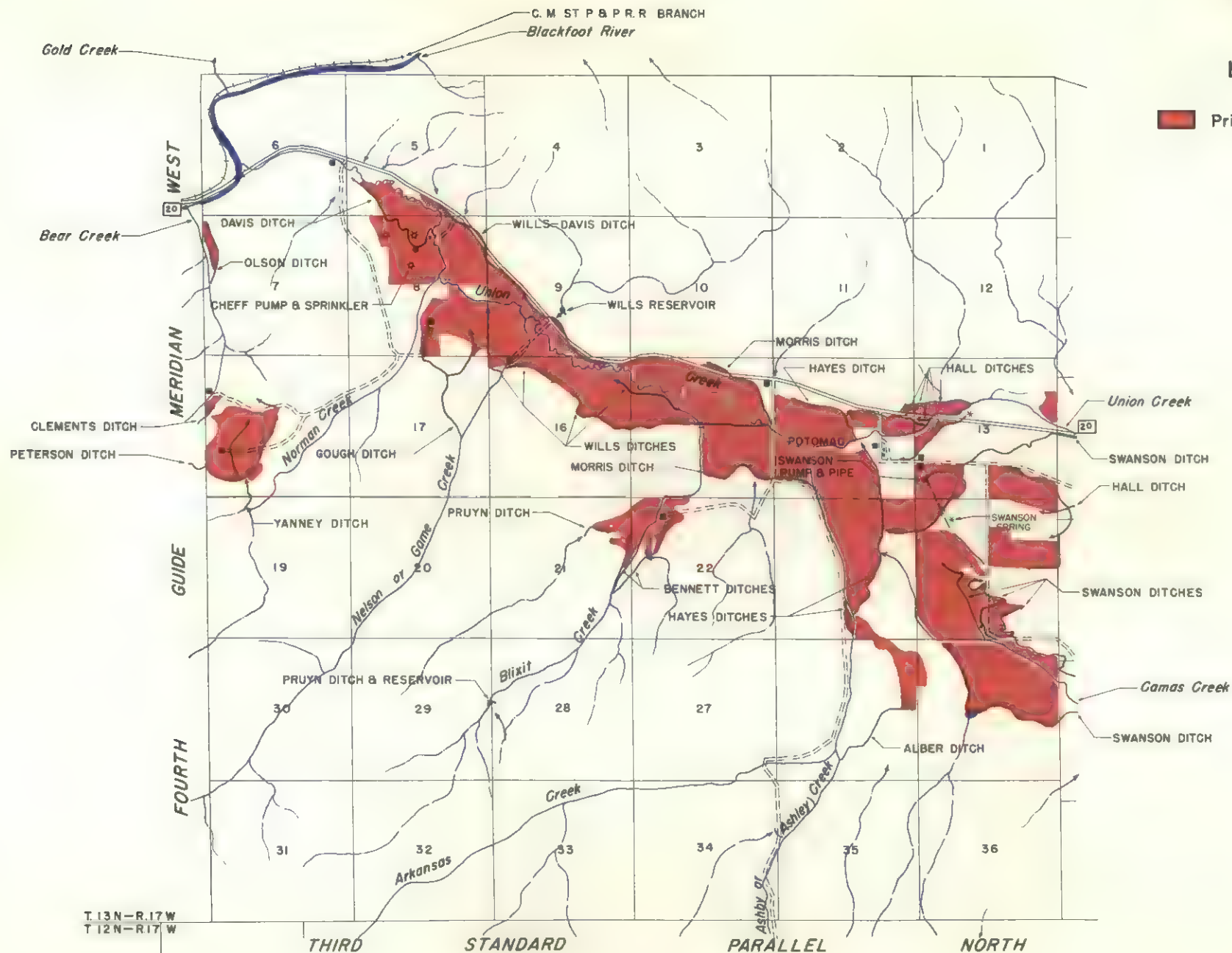
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 Private Irrigation

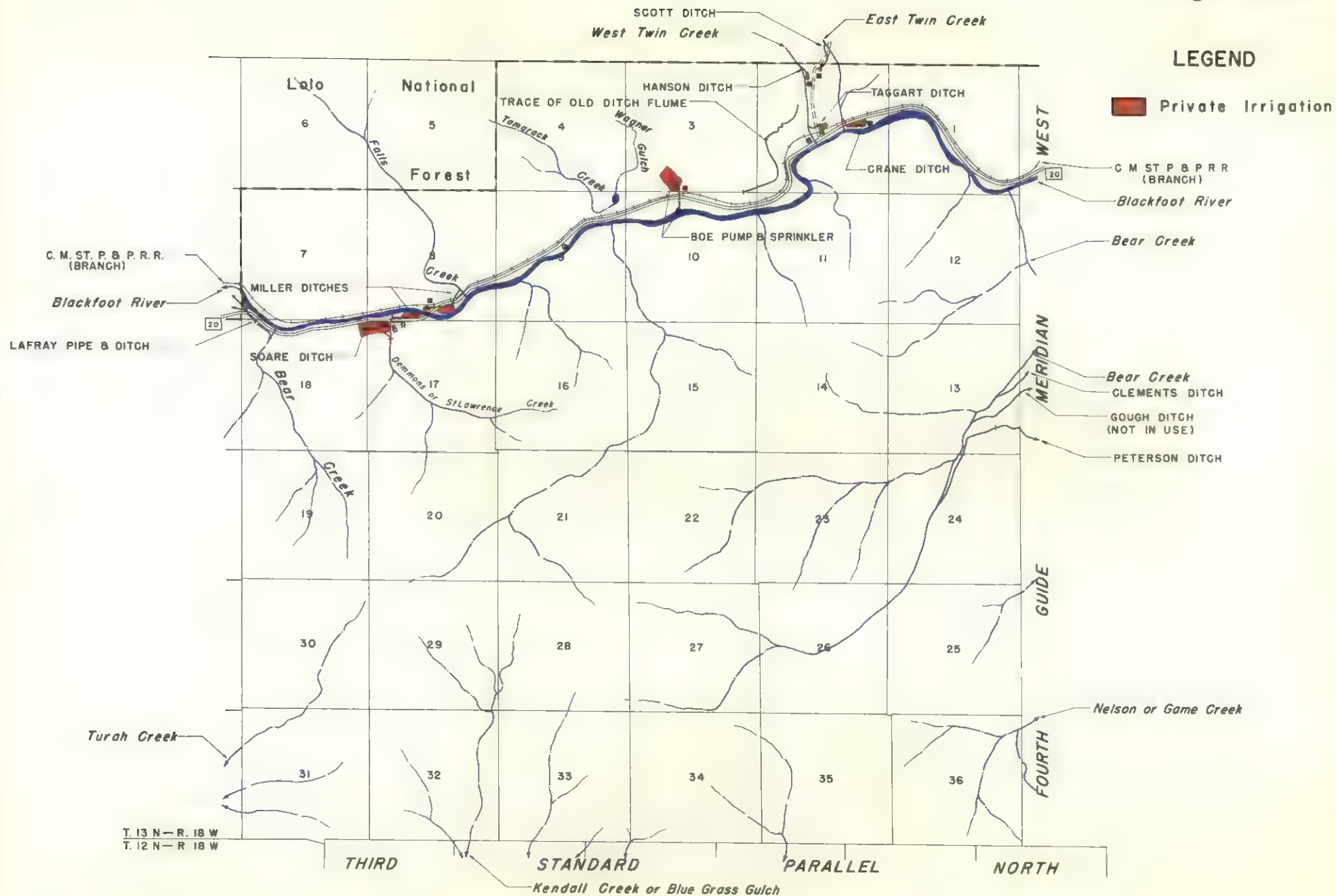


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Private Irrigation

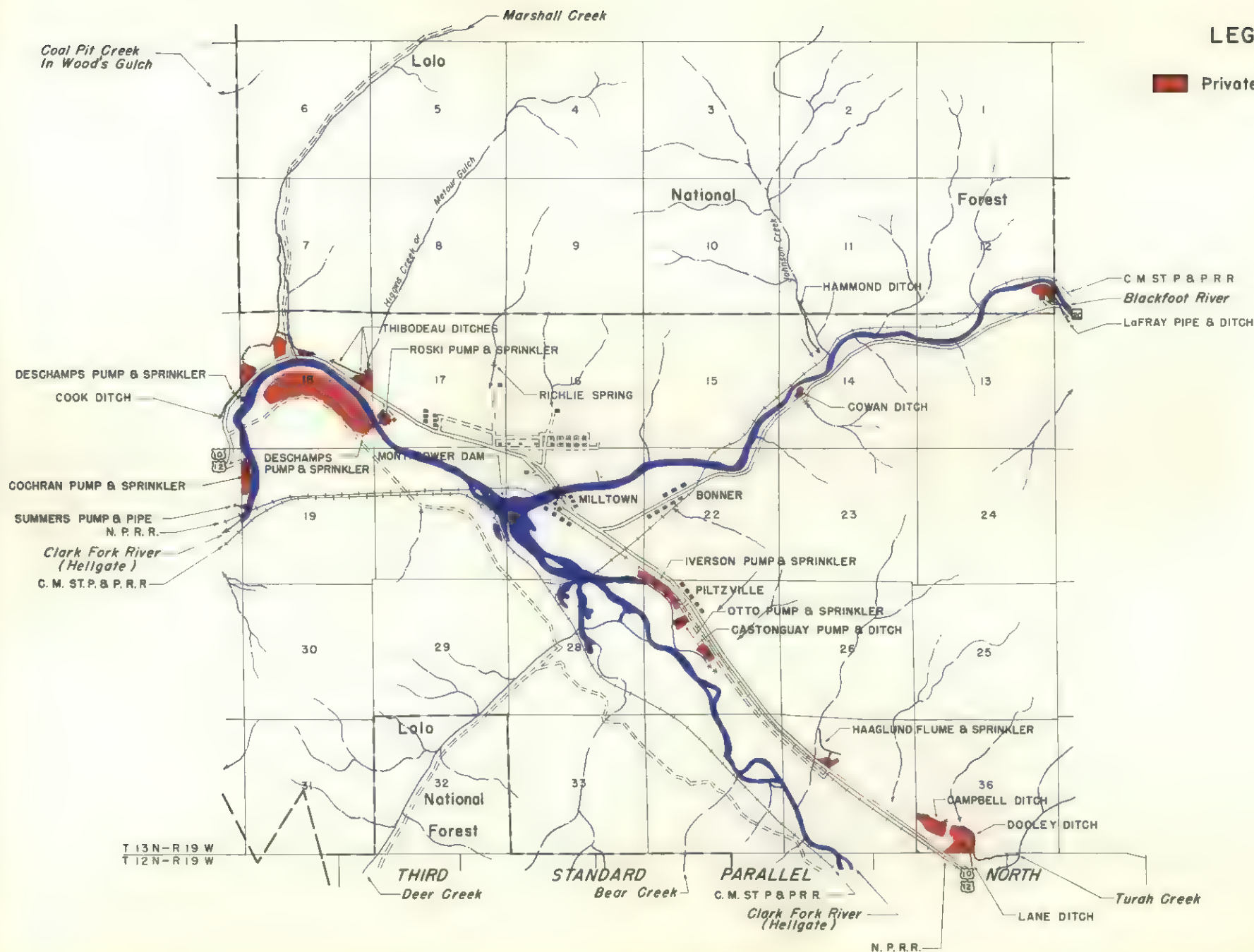


T. 13N-R. 17W
T. 12N-R. 17W



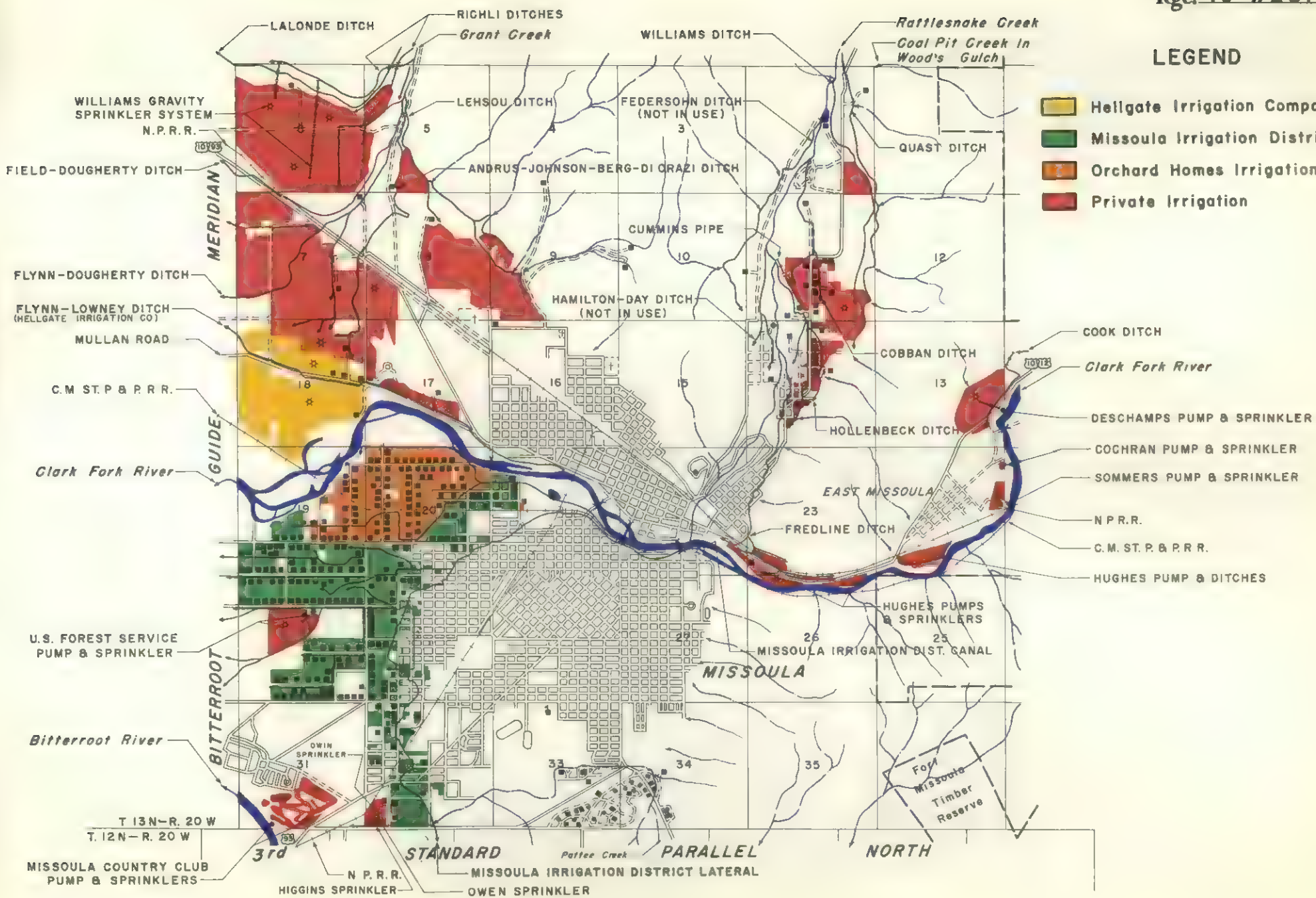
LEGEND

 Private Irrigation



LEGEND

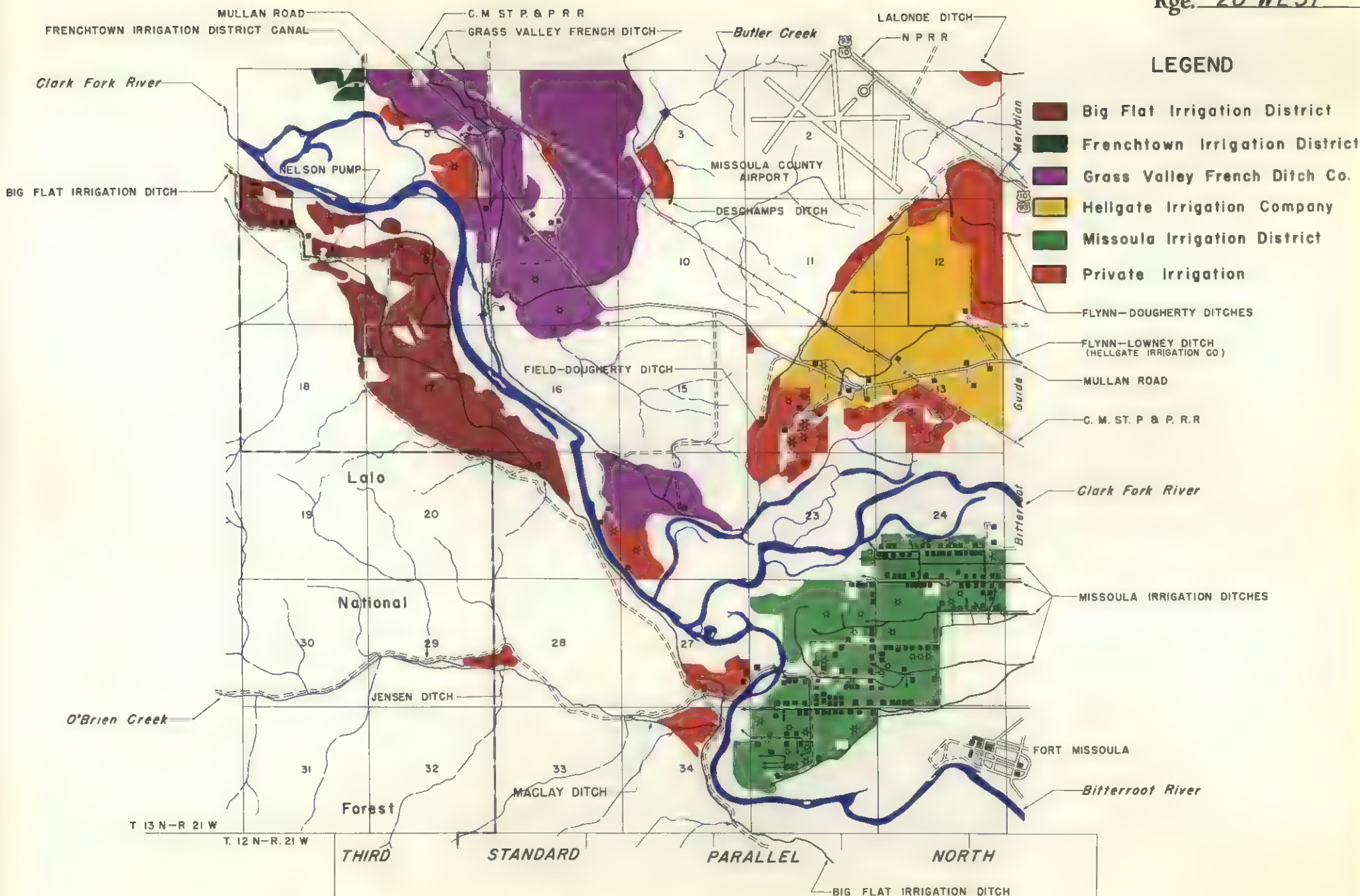
- Hellgate Irrigation Company
- Missoula Irrigation District
- Orchard Homes Irrigation Co.
- Private Irrigation



LEGEND

- Big Flat Irrigation District
- Frenchtown Irrigation District
- Grass Valley French Ditch Co.
- Hellgate Irrigation Company
- Missoula Irrigation District
- Private Irrigation

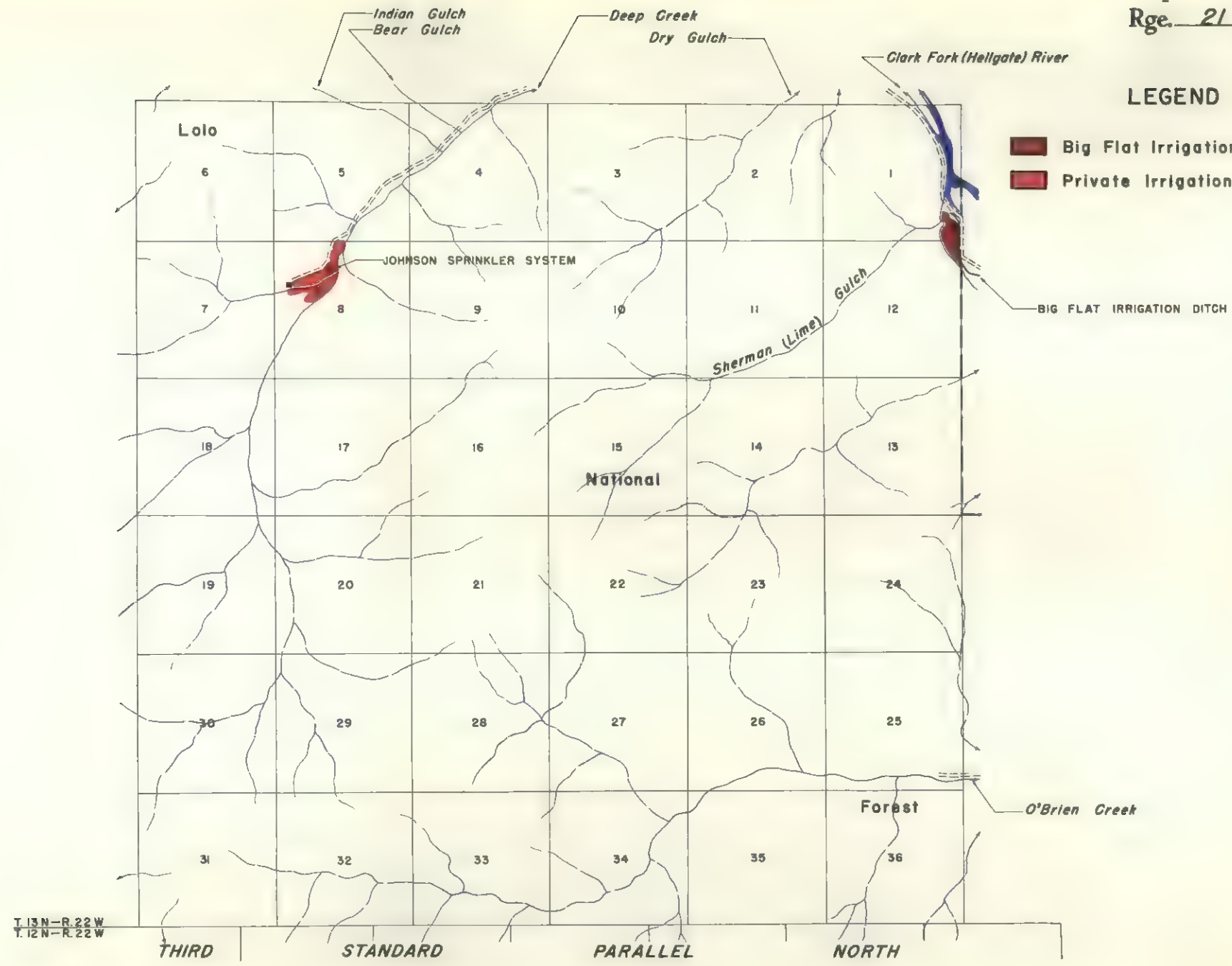
- FLYNN-DOUGHERTY DITCHES
- FLYNN-LOWNEY DITCH (HELLGATE IRRIGATION CO.)
- MULLAN ROAD
- C. M. ST. P. & P. R. R.
- Clark Fork River
- MISSOULA IRRIGATION DITCHES



Twp. 13 NORTH
 Rge. 21 WEST

LEGEND

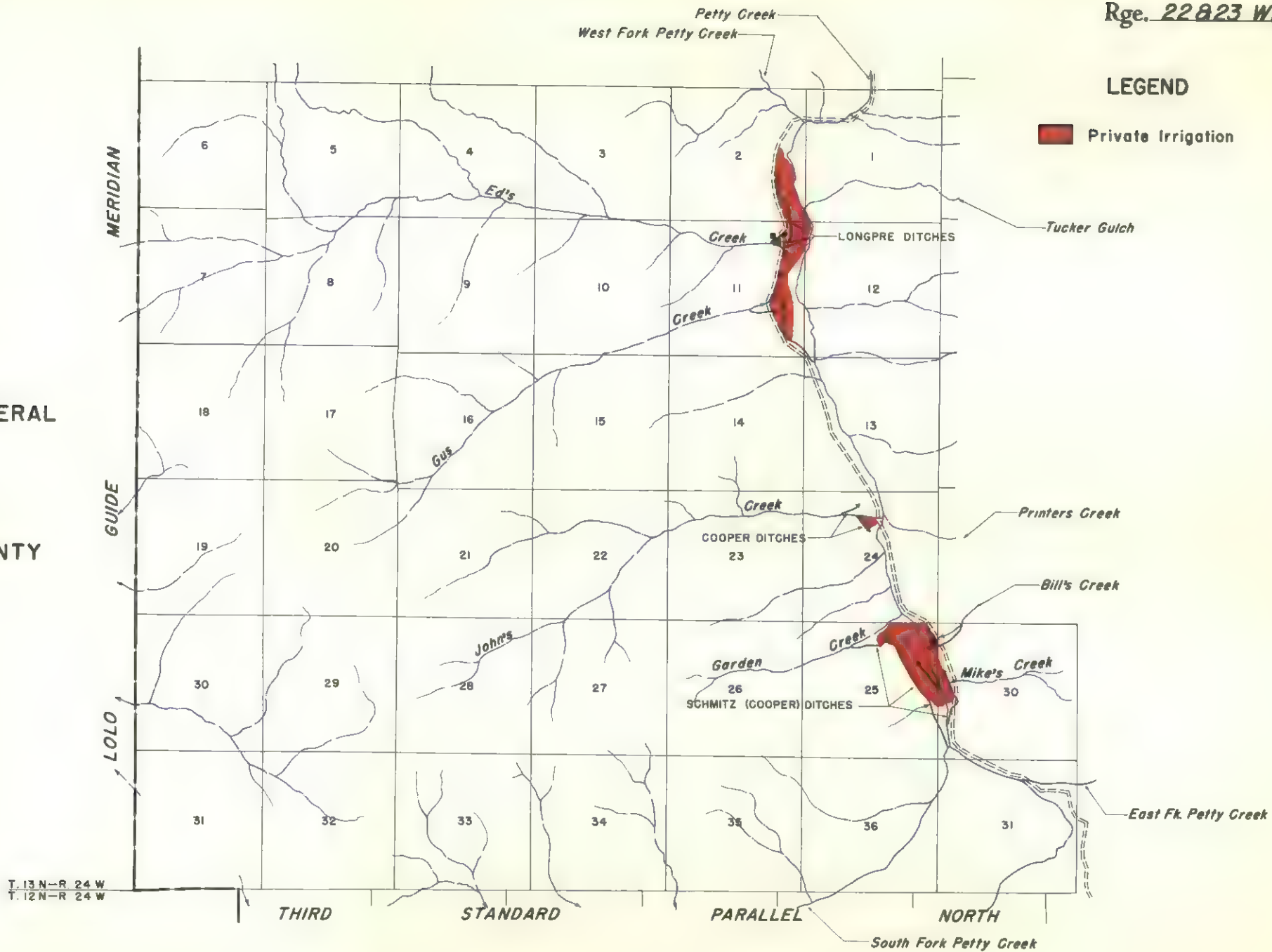
- Big Flat Irrigation District
- Private Irrigation



LEGEND

 Private Irrigation

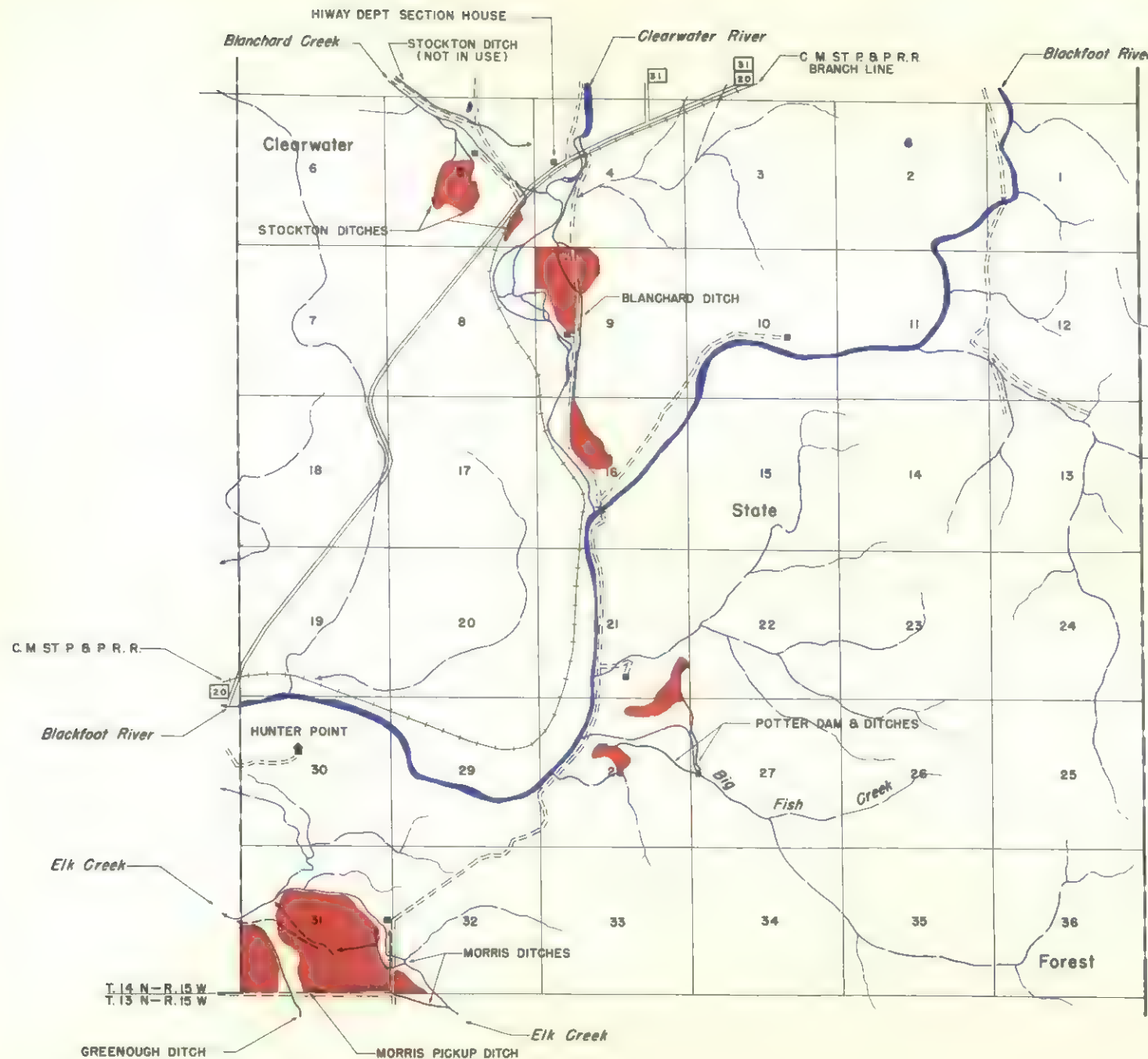
MINERAL
COUNTY



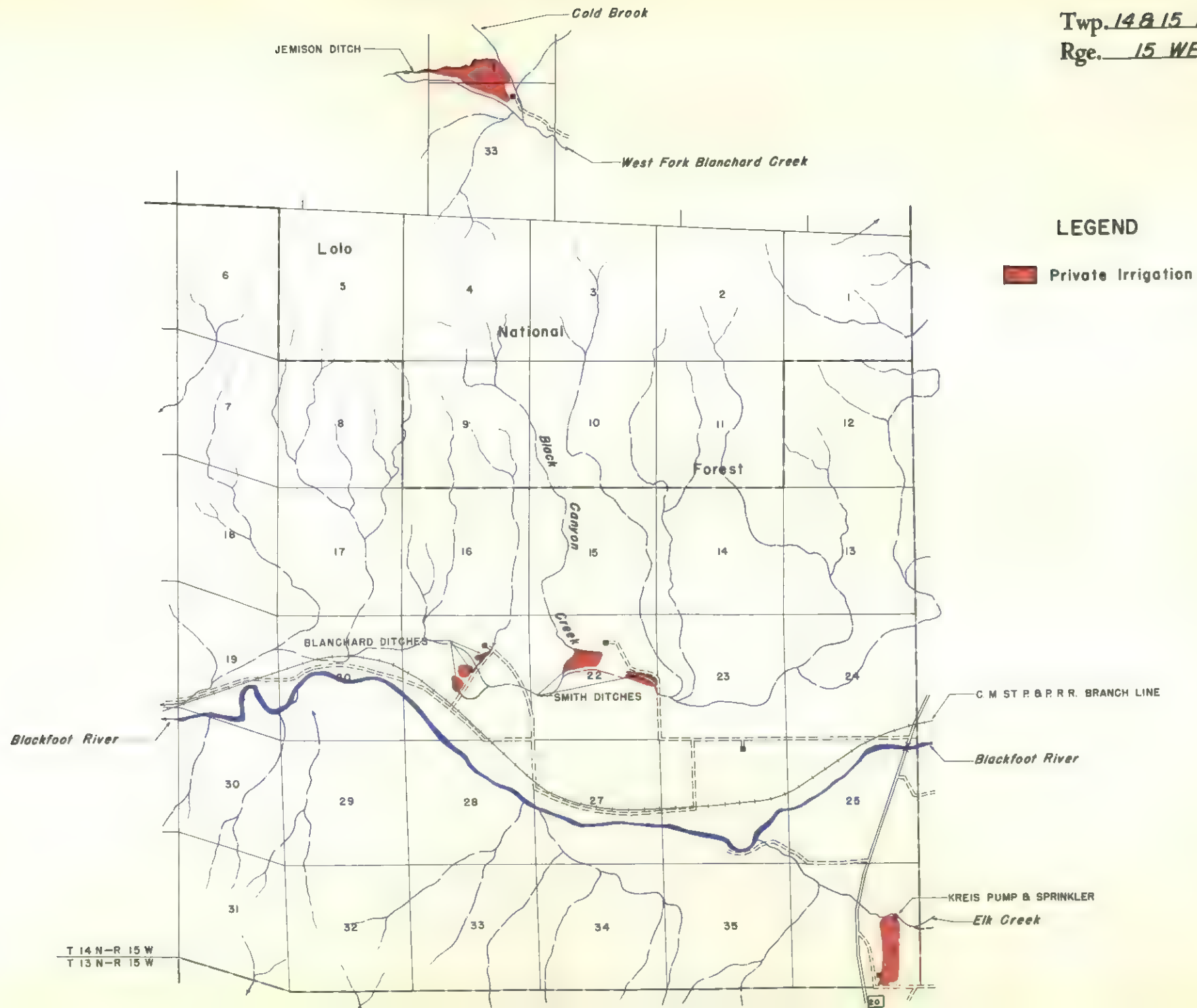
LEGEND

 Private Irrigation

POWELL
COUNTY

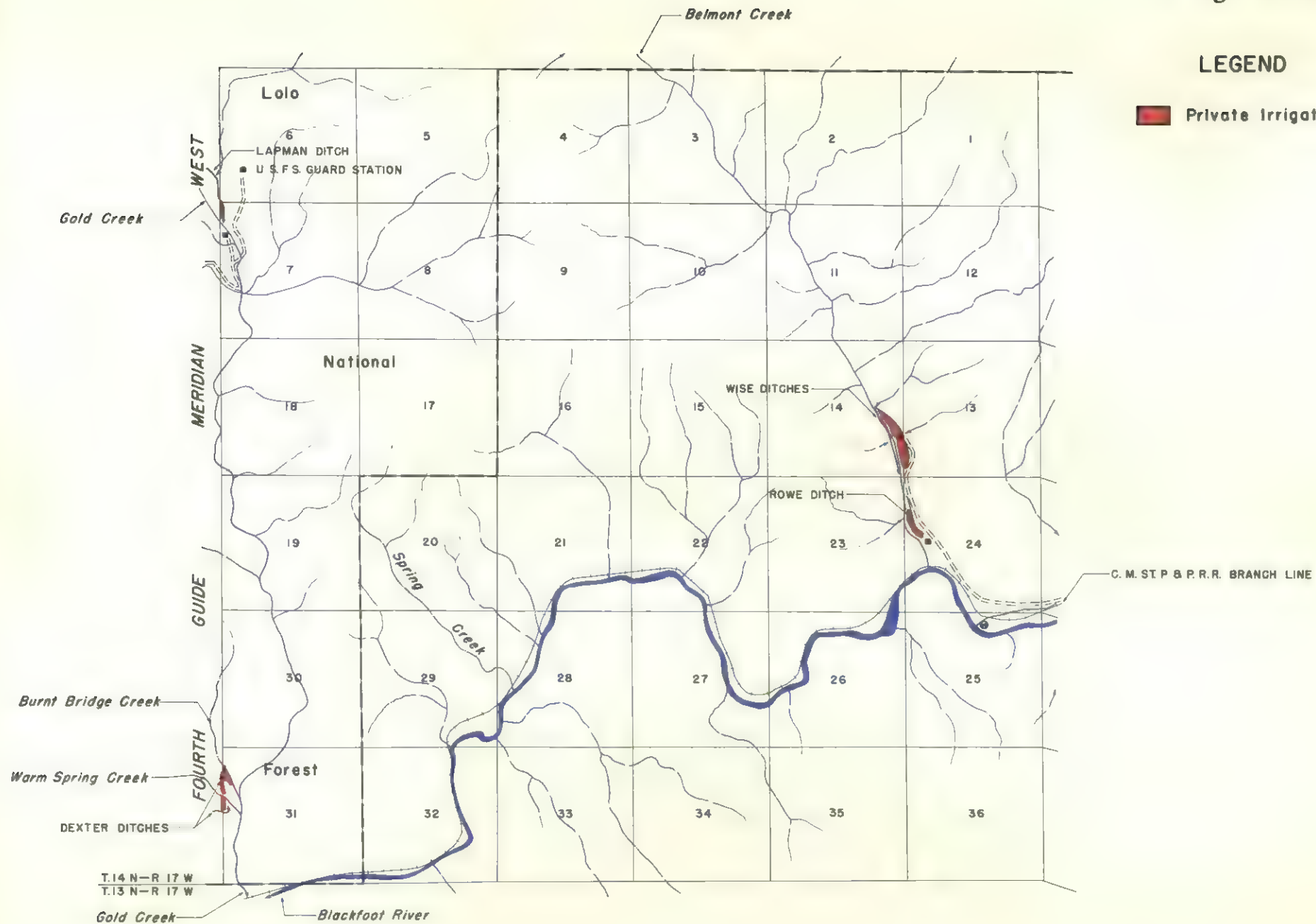


Twp. 14 & 15 NORTH
Rge. 15 WEST



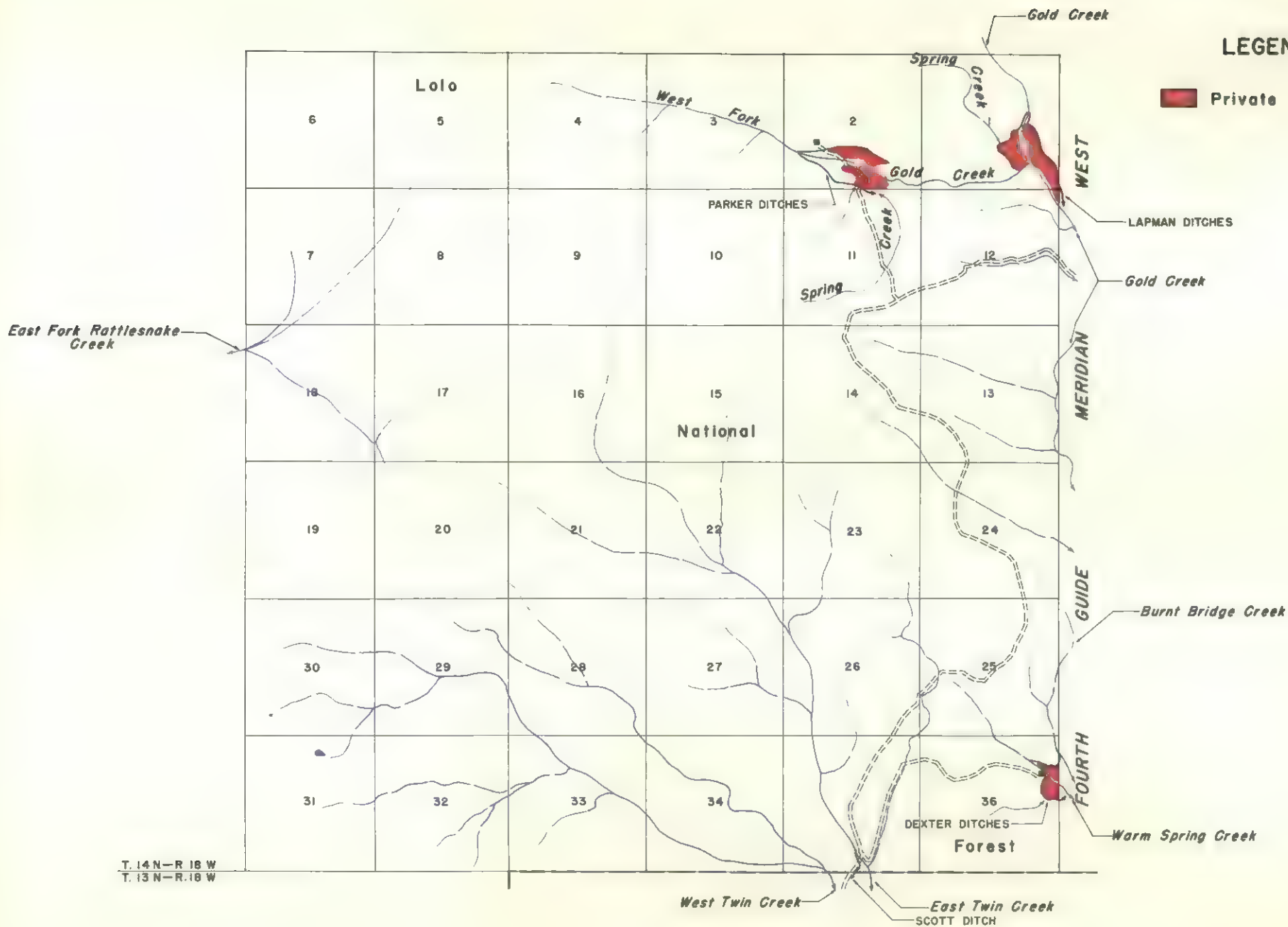
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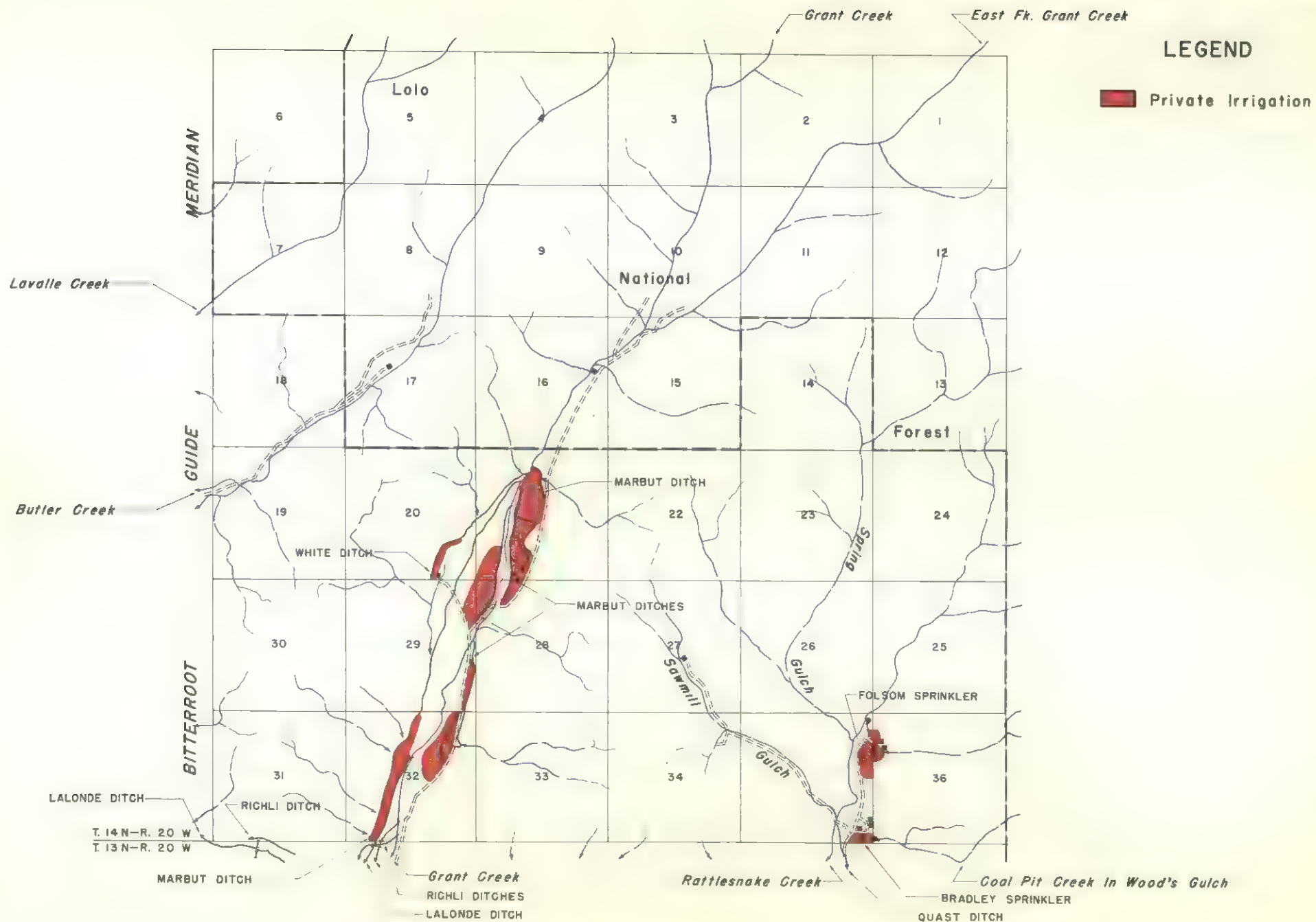
 Private Irrigation



LEGEND

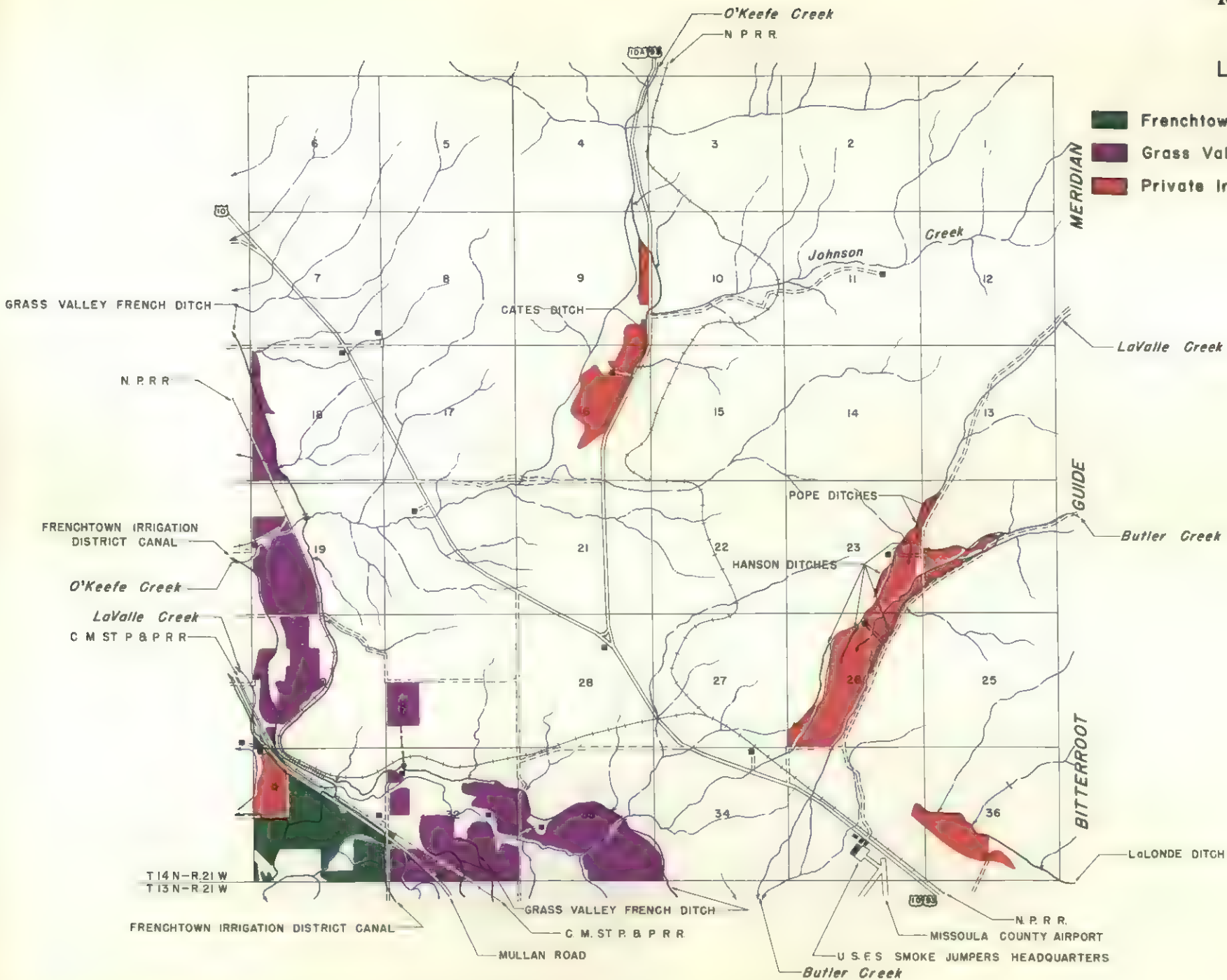
 Private Irrigation





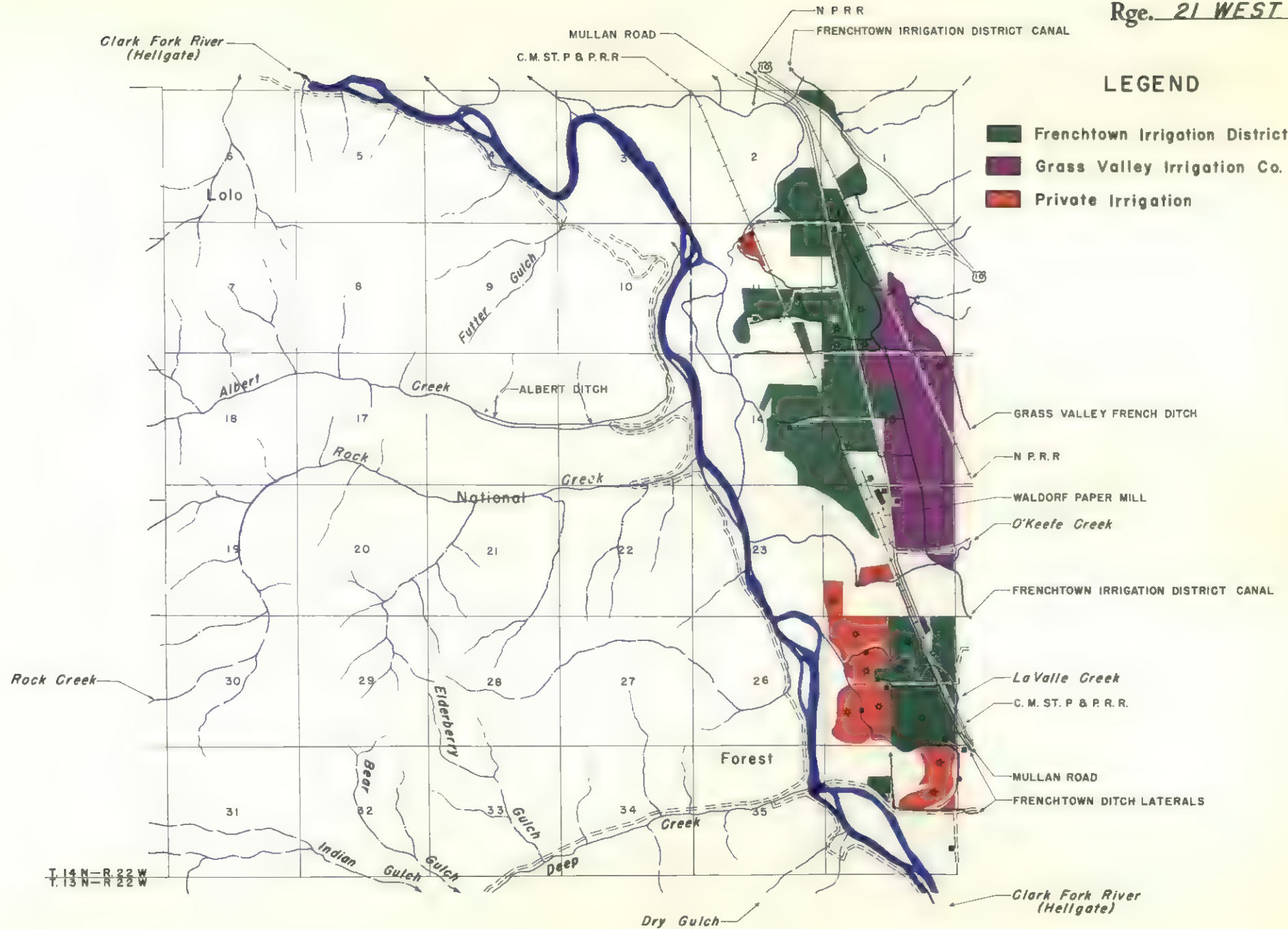
LEGEND

- Frenchtown Irrigation District
- Grass Valley French Ditch Co.
- Private Irrigation



LEGEND

- Frenchtown Irrigation District
- Grass Valley Irrigation Co.
- Private Irrigation



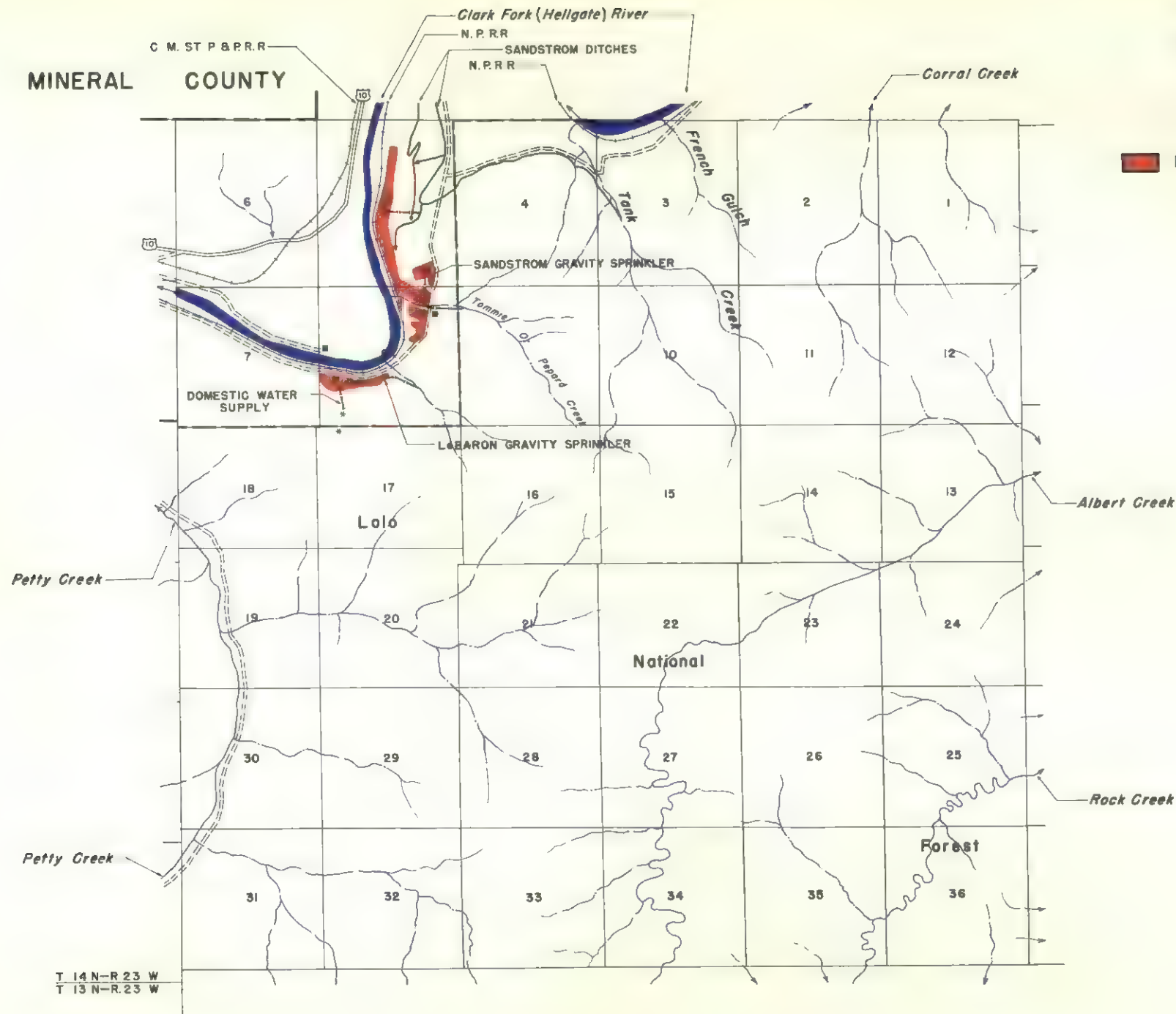
T. 14 N. R. 22 W.
T. 13 N. R. 22 W.

Twp. 14 NORTH
Rge. 22 WEST

MINERAL COUNTY

LEGEND

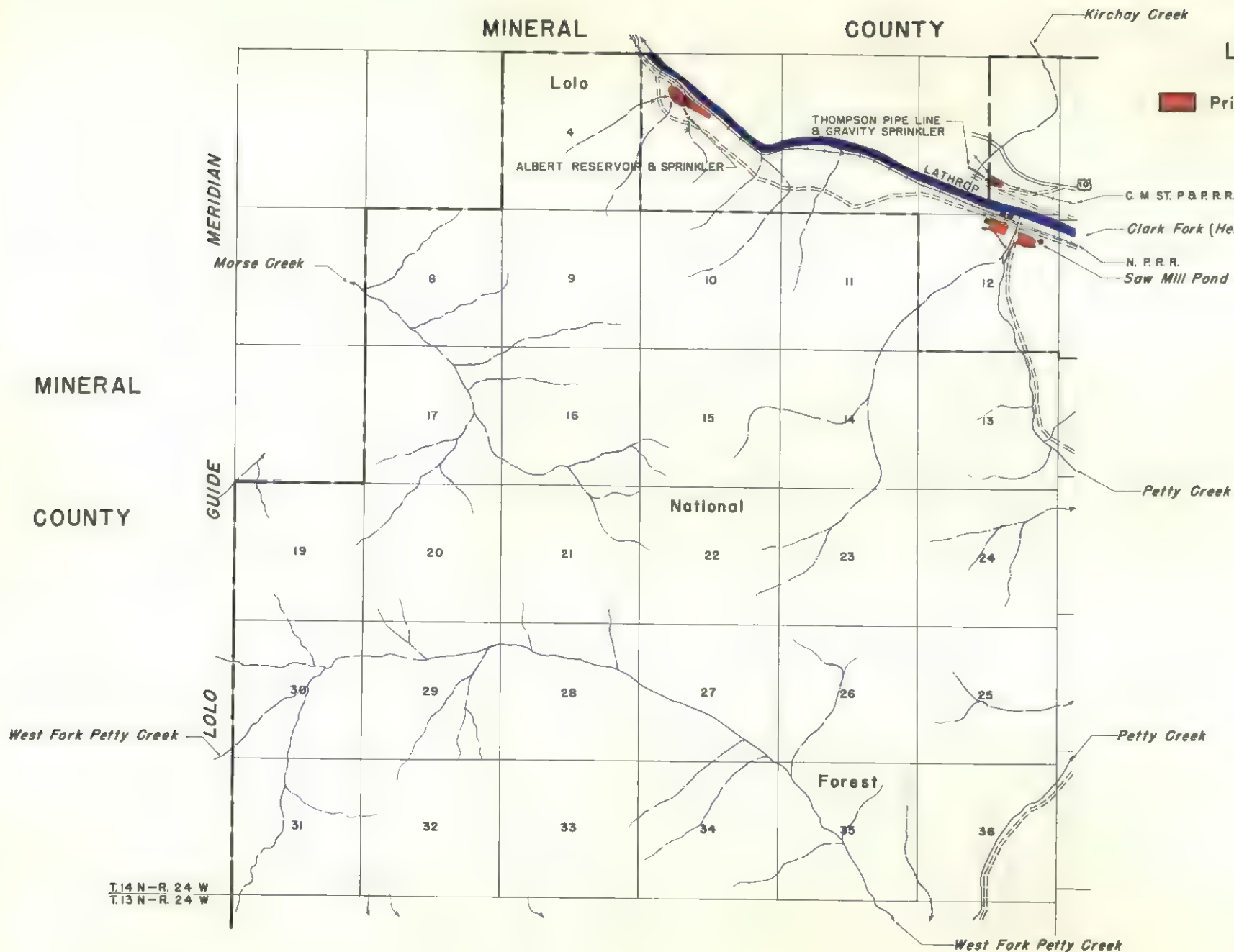
 Private Irrigation



MINERAL COUNTY

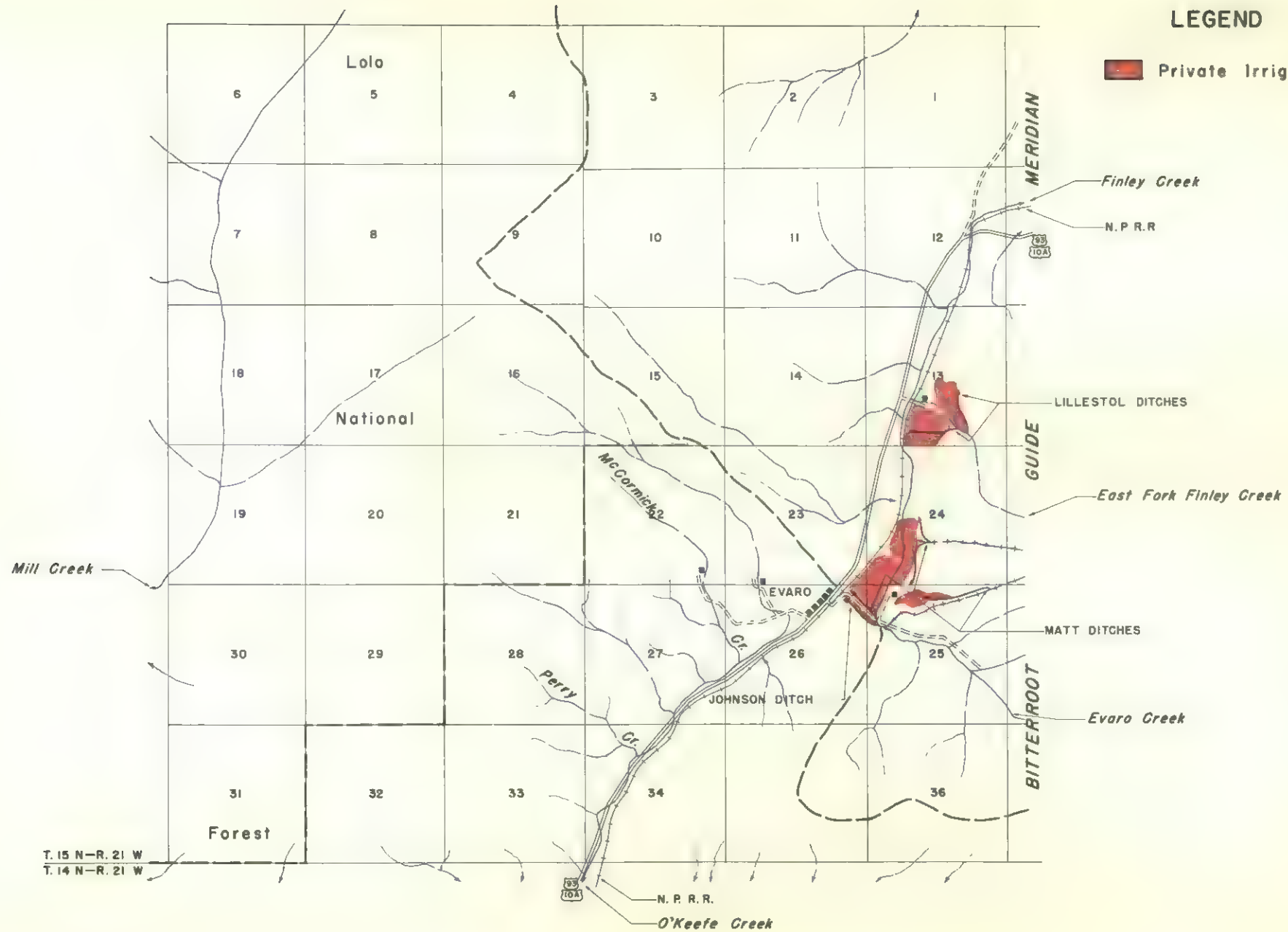
LEGEND

 Private Irrigation



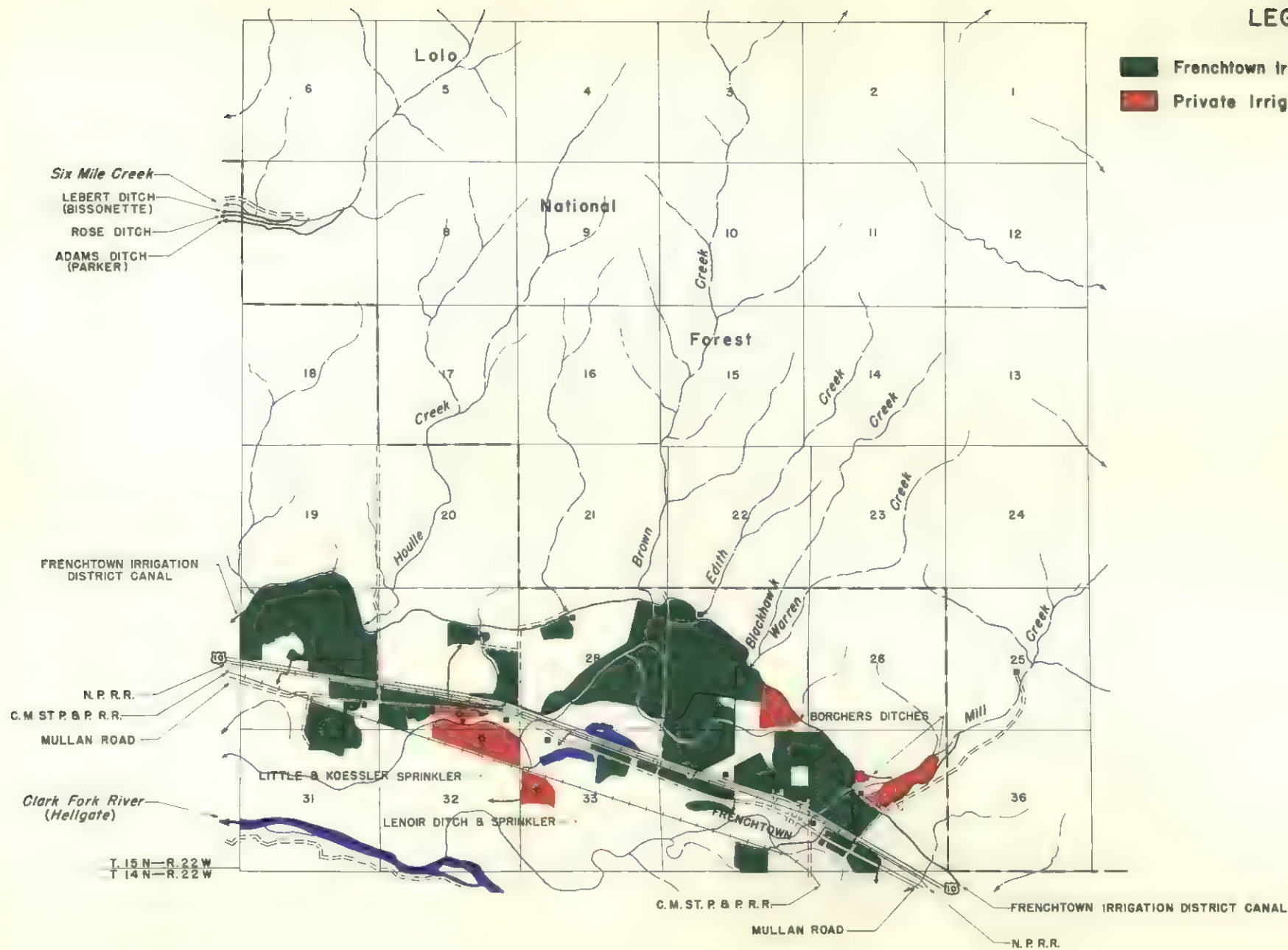
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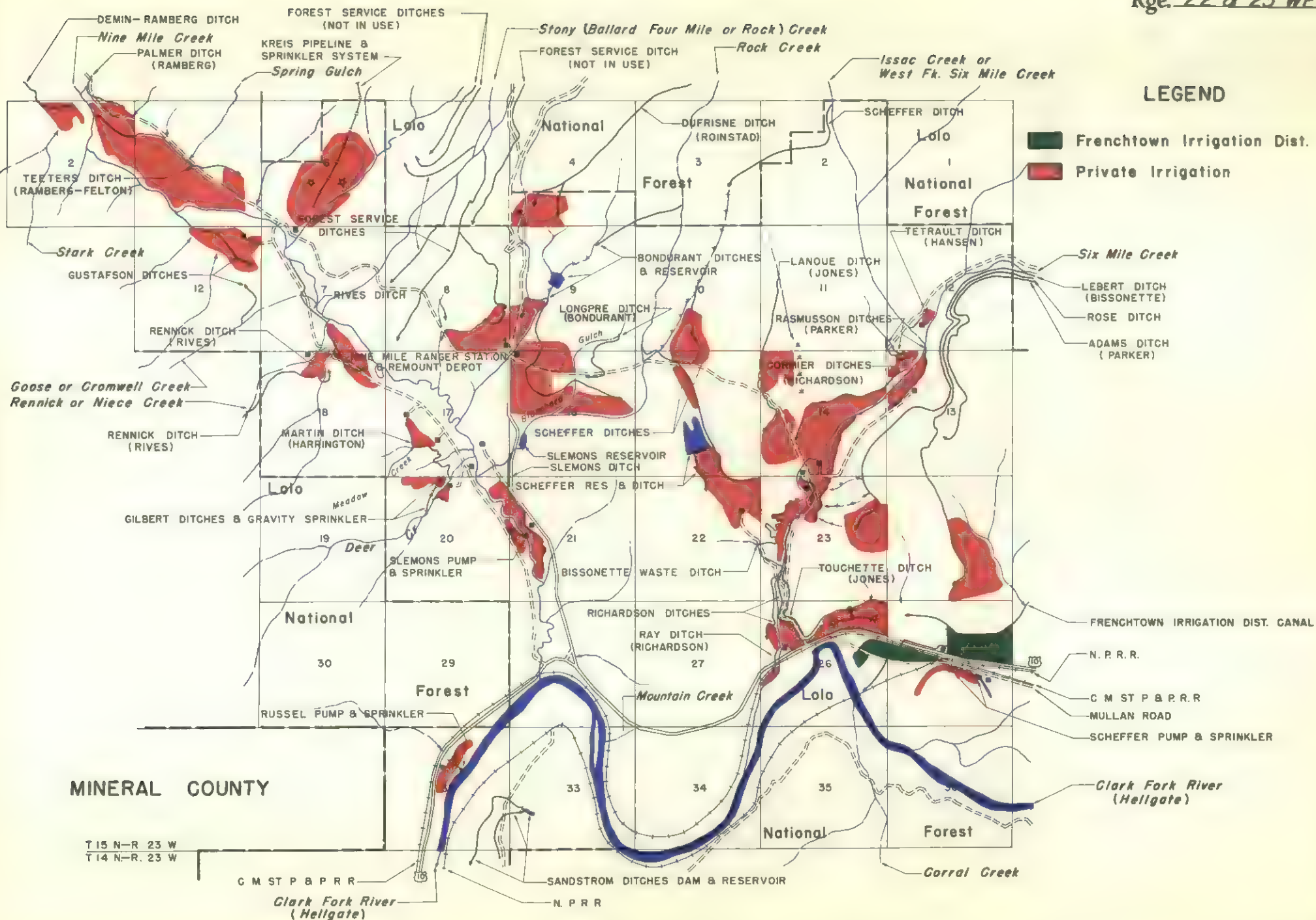
 Private Irrigation



LEGEND

- Frenchtown Irrigation District
- Private Irrigation

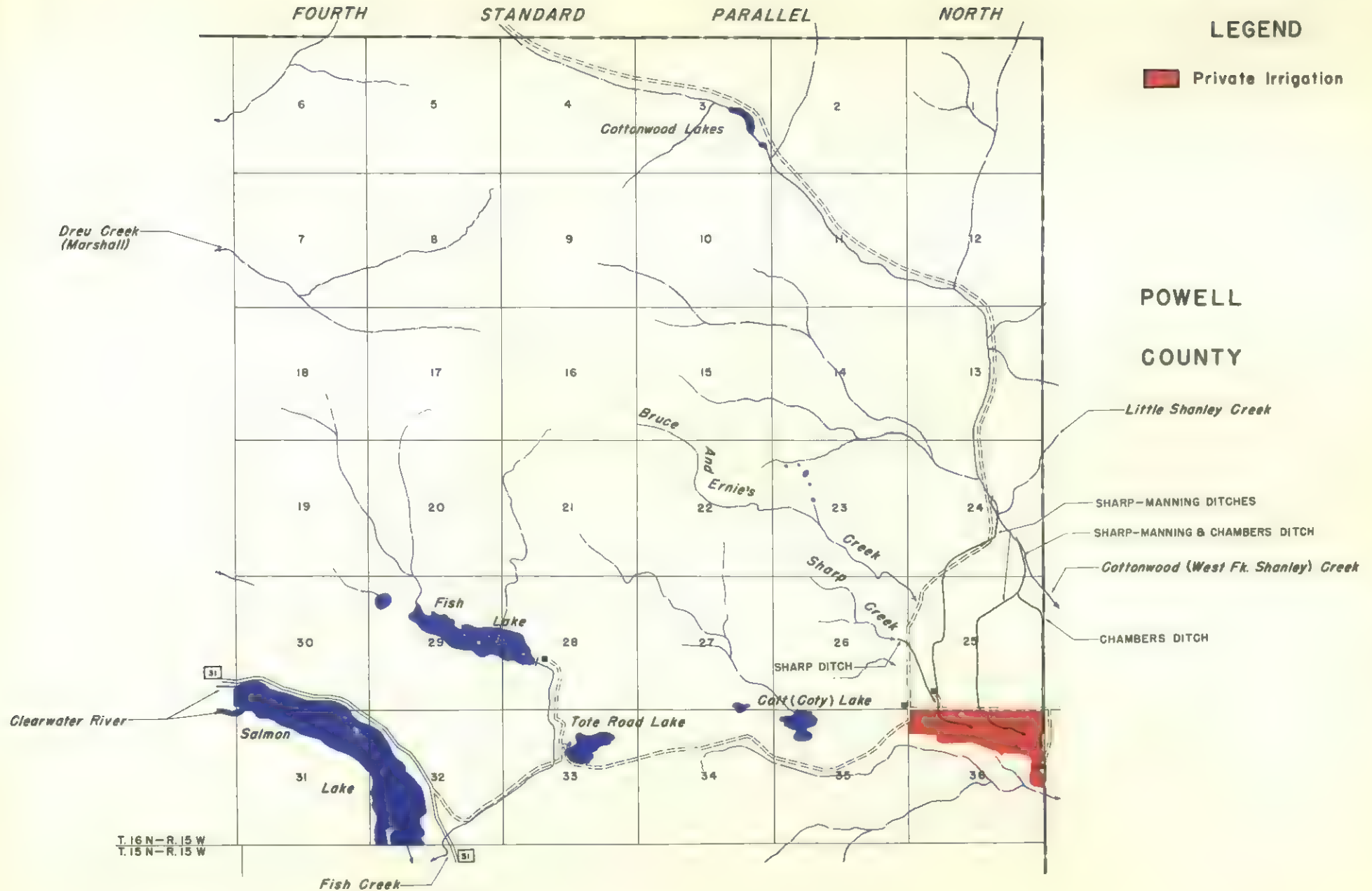


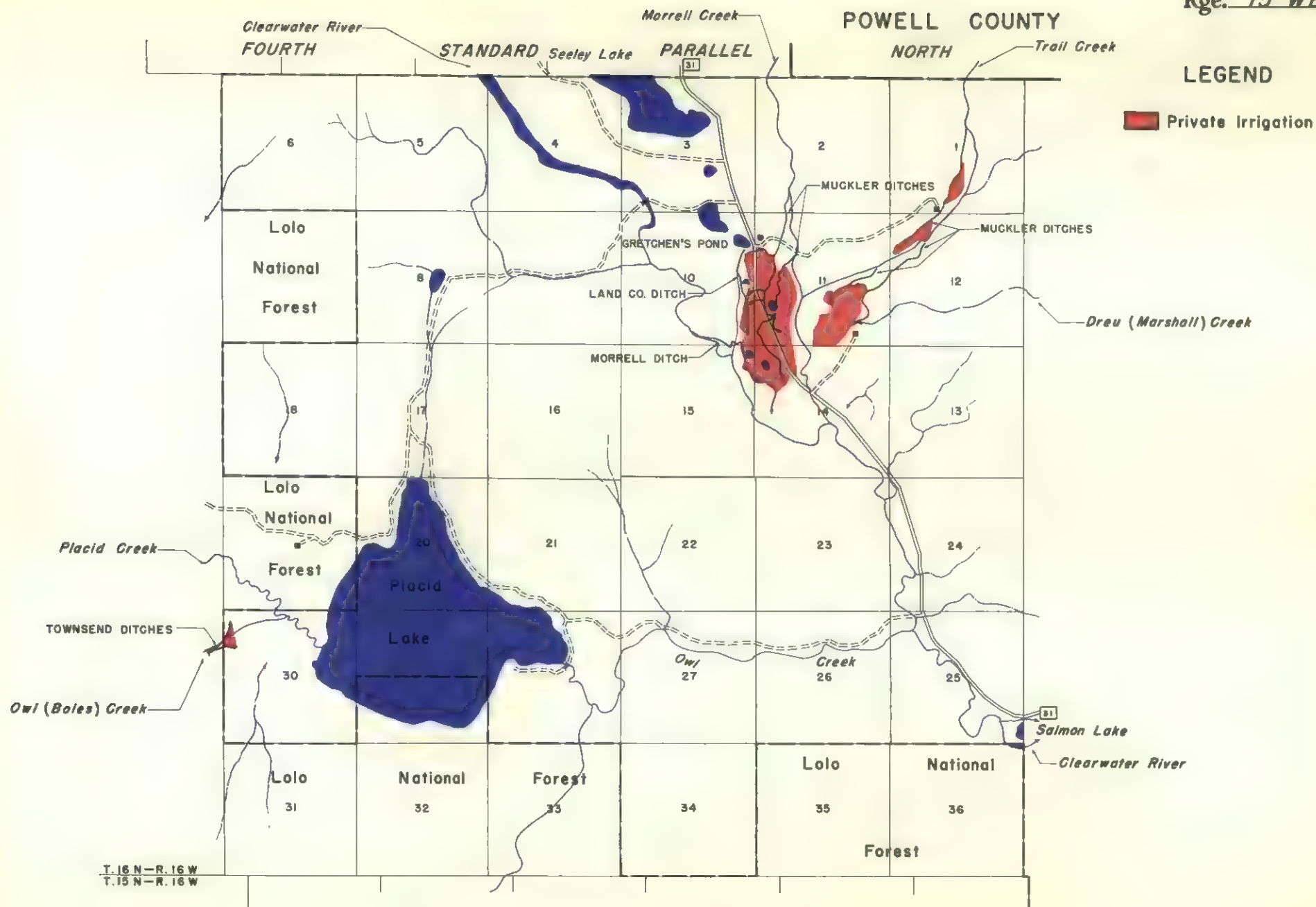


POWELL COUNTY

LEGEND

 Private Irrigation



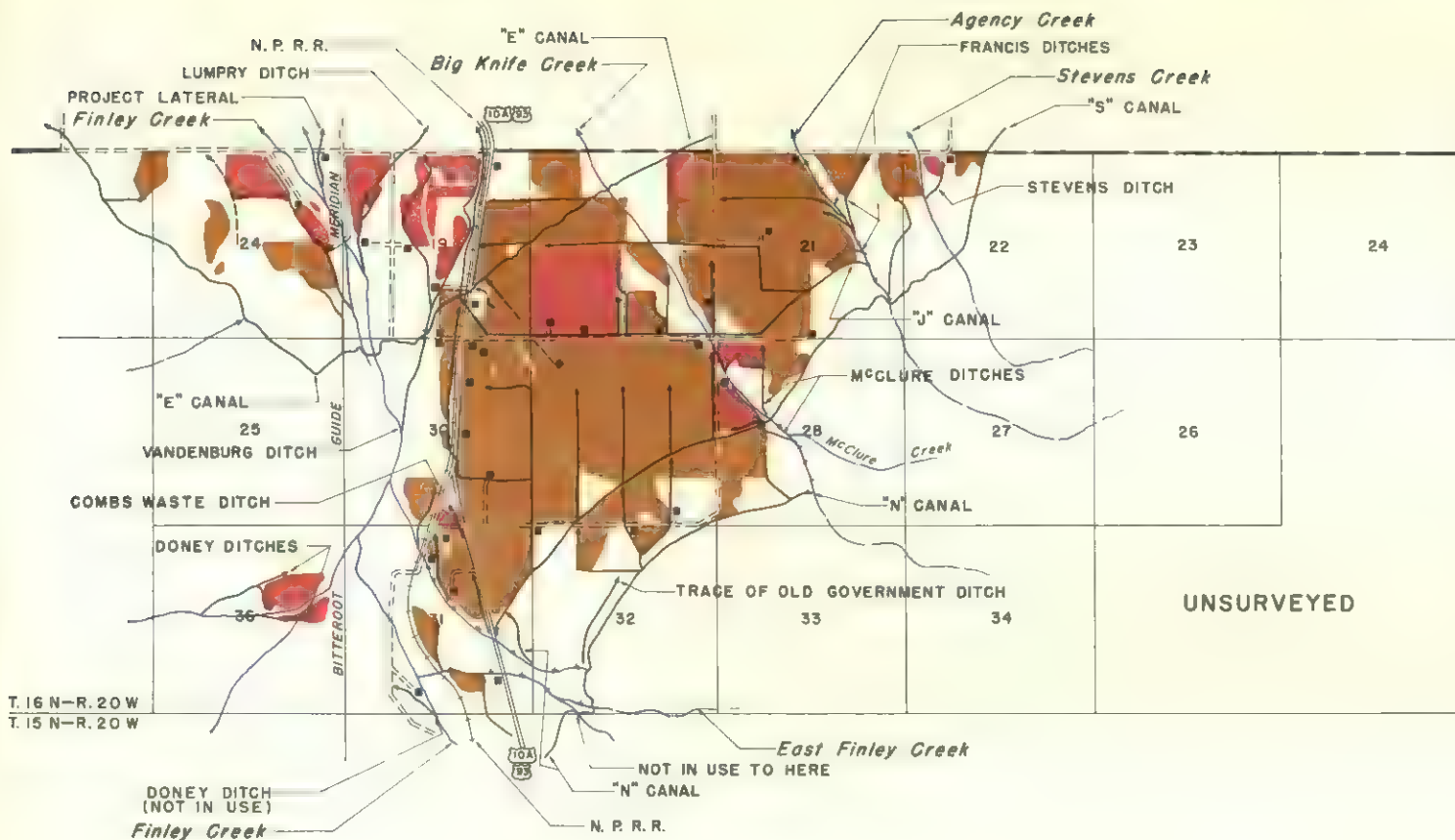


LAKE

COUNTY

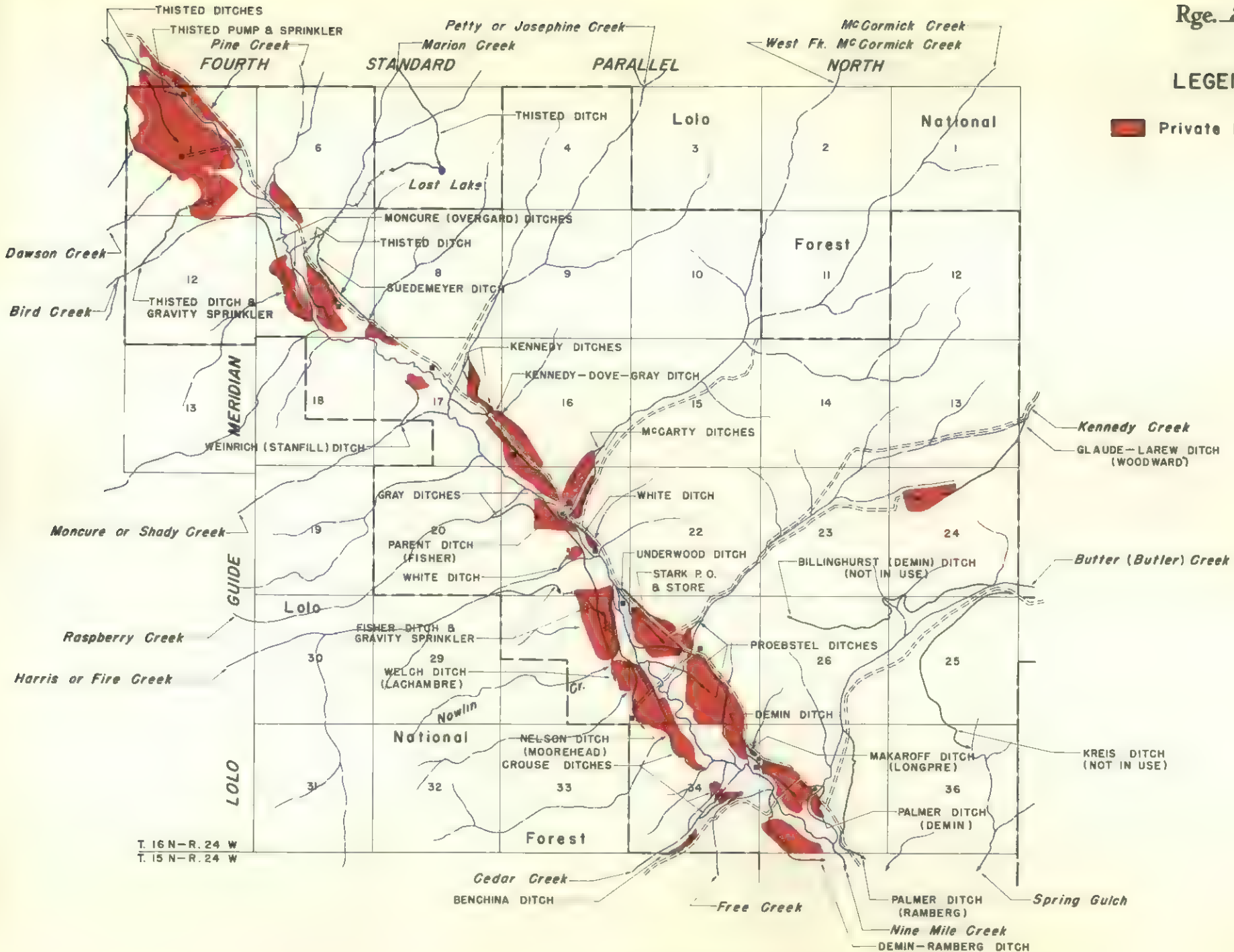
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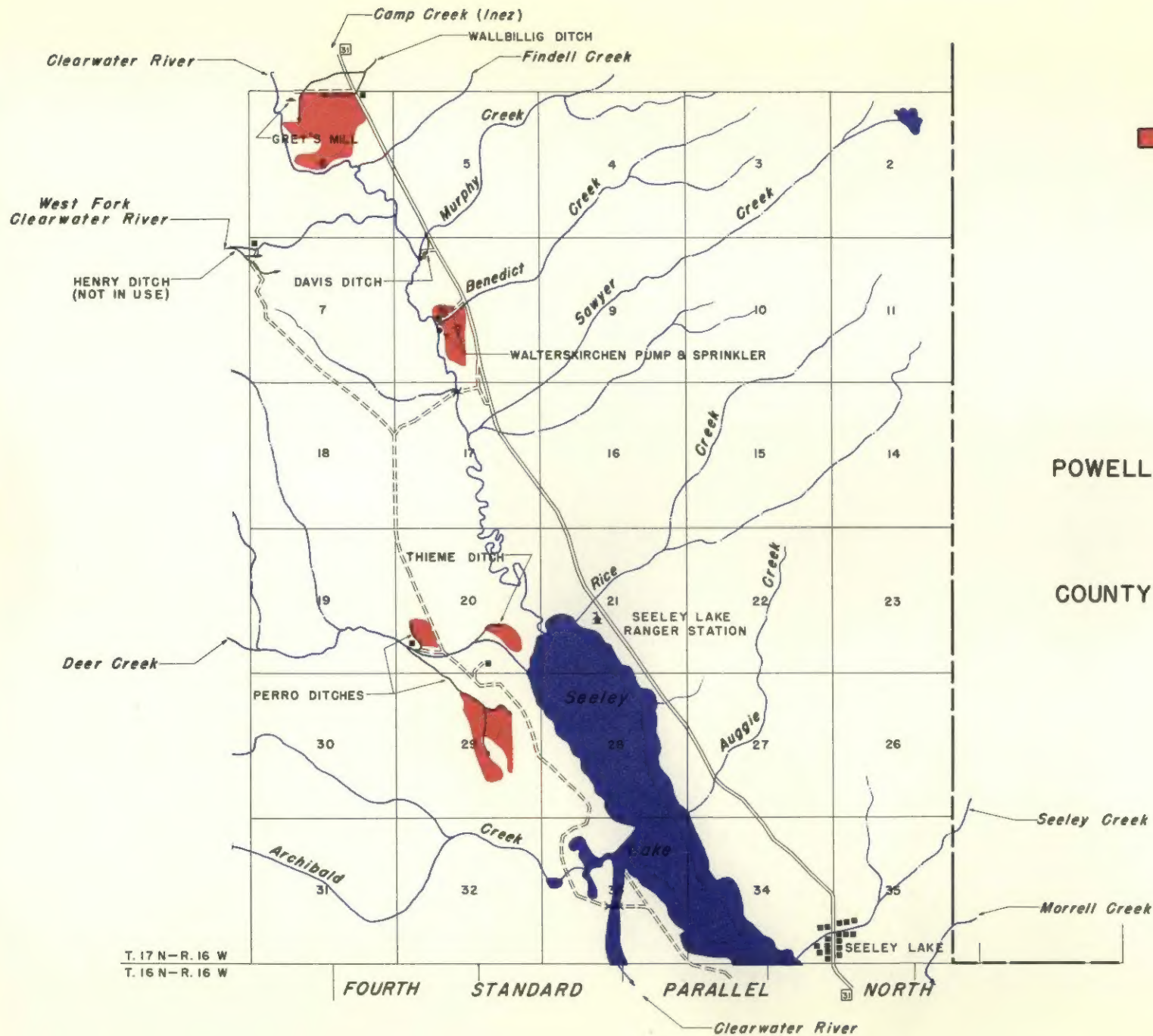
- Flathead Irrigation Project (Jocko Division)
- Private Irrigation



LEGEND

 Private Irrigation






LEGEND

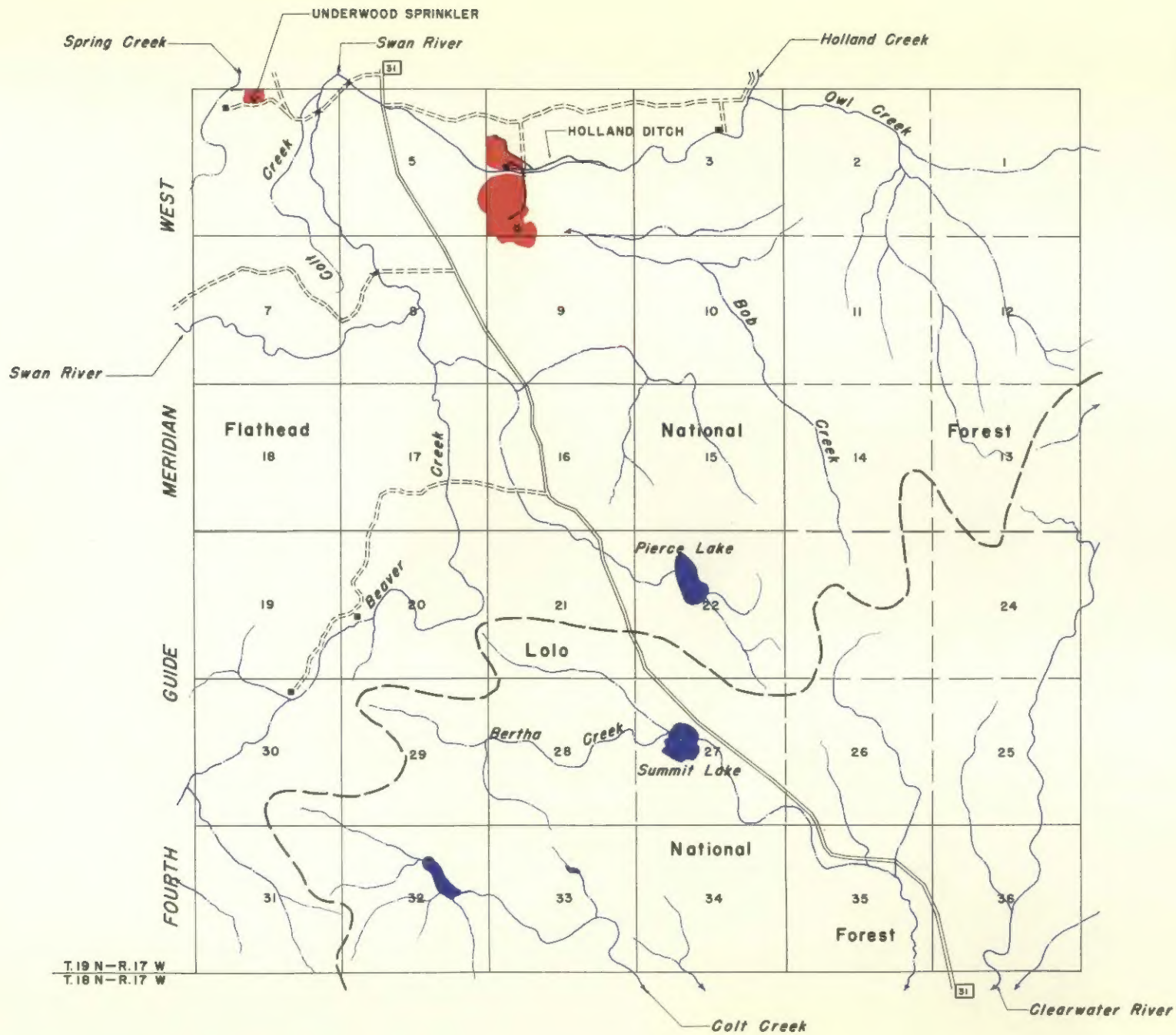
Private Irrigation

POWELL


COUNTY

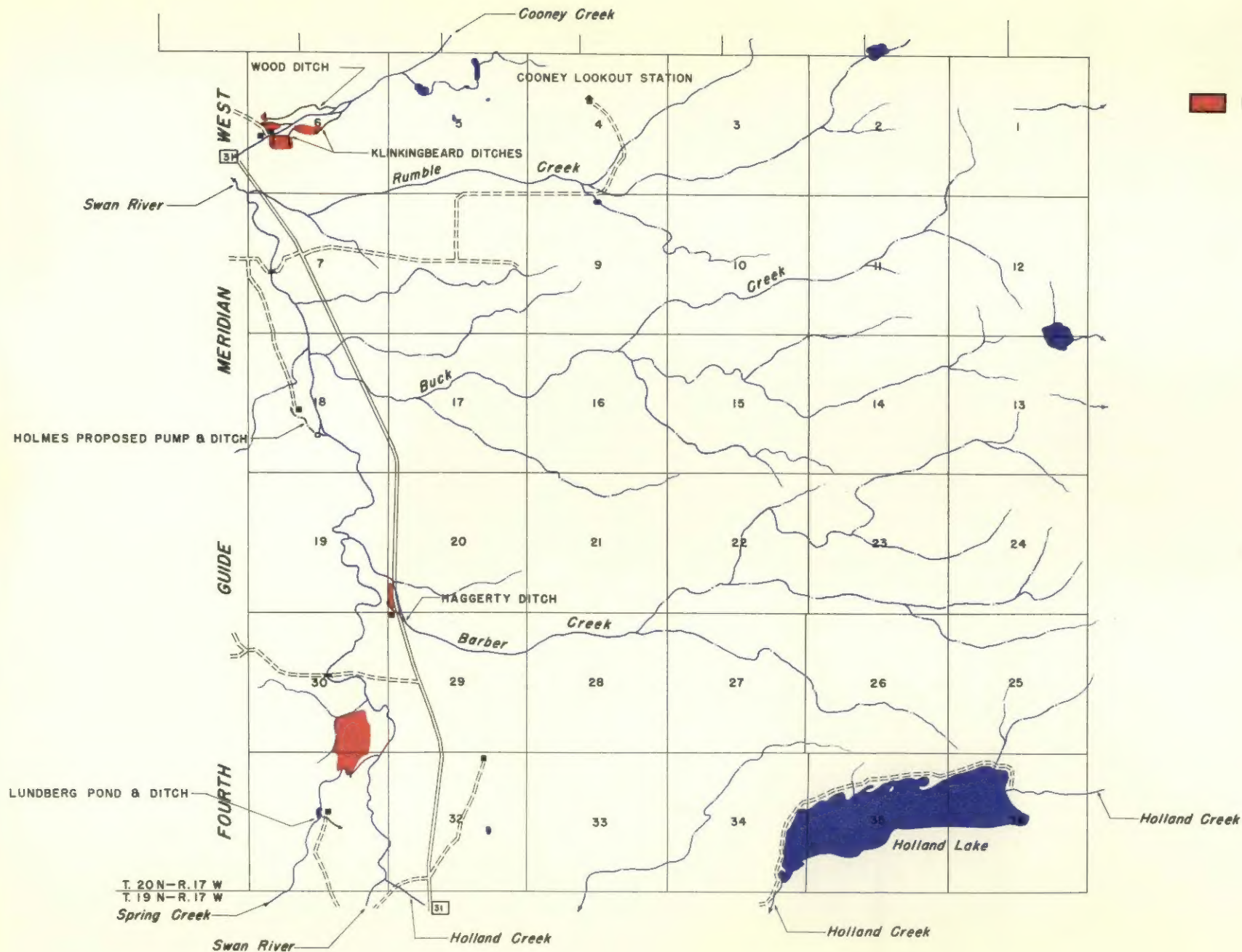
LEGEND

 Private Irrigation




LEGEND

 Private Irrigation



LEGEND

 Private Irrigation

